VOLUME 65 NUMBER 10

MONTHLY WEATHER REVIEW

OCTOBER 1937

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UNITED STATES DEPARTMENT OF AGRICULTURE
WEATHER BUREAU
Washington, D. C.
1937

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CORRECTION

Volume 25, March 1967, page 210, in the last column of the table, second line, "195" should be "295".

DEPOSITED BY THE
UNITED STATES OF AMERICA

JAN 22 1938

MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 65, No. 10
W. B. No. 1220

OCTOBER 1937

CLOSED DECEMBER 3, 1937
ISSUED JANUARY 10, 1938

SERIAL NUMBERS OF WEATHER BUREAU PUBLICATIONS

By HERBERT LYMAN

[Weather Bureau, Washington, November 1937]

Beginning with January 1895 a serial number (e. g., W. B. 525) has been given to every Weather Bureau publication [2] that has a full title page or cover.[1] This series includes all folio, quarto, and octavo bulletins, Instrument Division circulars, important miscellaneous publications and extracts from the MONTHLY WEATHER REVIEW, and the successive numbers of the MONTHLY WEATHER REVIEW. As it was found that 59 publications had been issued prior to 1895, counting from the date on which the Weather Bureau was organized by the transfer of the meteorological duties of the Signal Service of the Army to the Department of Agriculture, July 1, 1891, the first publication of 1895 was given the serial number 60. The 59 numbers above referred to do not include the numerous publications issued by the Bureau (Signal Service) prior to its transfer from the War Department to the Department of Agriculture.

The reader is particularly urged to note carefully that the symbol "W. B. No. 545" refers to the *serial number* in the following list; it does *not* mean "Weather Bureau Bulletin No. 545," and should not be referred to as such.

Following is a list of publications in order of serial numbers except the MONTHLY WEATHER REVIEW and CLIMATOLOGICAL DATA which are given in separate tables, numbers 1 and 2, respectively.

W. B. No.	Title of publication
61	Instructions to Observers, and Code for Enciphering Reports at Cotton Region and Sugar and Rice Stations of the Weather Bureau.
63	Studies of Weather Types and Storms. No. 1. Types of Storms in January. Extract from Monthly Weather Review.
66	Circular B. Instructions for Use of Maximum and Minimum Thermometers. C. F. Marvin. Revised edition.
67	Circular C. Instructions for Use of the Rain Gauge. C. F. Marvin. Revised edition.
69	Climate and Health. No. 1.
71	Climate and Health. No. 2.
73	Climate and Health. No. 3.
75	Climate and Health. No. 4.
77	Bulletin No. 16. The Determination of the Relative Quantities of Aqueous Vapor in the Atmosphere by means of the Absorption Lines of the Spectrum. L. E. Jewell.
78	Climate and Health. No. 5.
80	Instructions to Wind-Signal (Storm-Warning) Displaymen of the Weather Bureau.
81	Statistics of the State Weather Services. O. L. Fassig. *Extract from* Monthly Weather Review.
82	Climate and Health. No. 6.
84	Climate and Health. Vol. 2, No. 1.
85	Departures from Normal Temperatures and Rainfall, with Crop Yields in Nebraska. H. H. C. Dunwoody.
86	Injury from Frost and Methods of Protection. H. E. Williams.
87	Display of Wind Signals on the Great Lakes.
88	Bulletin No. 17. The Work of the Weather Bureau in Connection with the Rivers of the United States. Willis L. Moore.
90	Bulletin No. 18. Report of the Fourth Annual Meeting of the American Association of State Weather Services, held at Indianapolis, Indiana, October 16 and 17, 1895. James Berry.
92	Studies of Weather Types and Storms. Part 2. E. B. Garriott and others. *Extract from* Monthly Weather Review.
93	Climate and Health. Vol. 2, No. 2.
96	Climate and Health. Vol. 2, No. 3.
97	Bulletin No. 19. Report on the Relative Humidity of Southern New England and other Localities. A. J. Henry.
100	Bulletin No. 13. Temperatures Injurious to Food Products in Storage and During Transportation, and Methods of Protection from the Same. H. E. Williams. Reprinted as Farmers' Bulletin No. 125.
102	St. Louis Tornado. H. C. Frankenfield and A. J. Henry. *Extract from* Monthly Weather Review.
104	Responses to the Programme of Questions Proposed for Discussion at the International Meteorological Conference to be held in Paris, September 1896.
109	Circular G, Instrument Division. Instructions for the Care and Management of Sunshine Recorders. C. F. Marvin.
110	Kite Experiments at the Weather Bureau. C. F. Marvin. *Extract from* Monthly Weather Review.
112	Daily River Stages. Part V. For the years 1893, 1894, and 1895.
114	Bulletin No. 20. Storms, Storm Tracks, and Weather Forecasting. F. H. Bigelow.
119	Instructions to Voluntary Observers, 1897.
122	A Monograph on the Mechanics and Equilibrium of Kites. C. F. Marvin. *Extract from* Monthly Weather Review.
124	The Standard System of Coordinate Axes for Magnetic and Meteorological Observations and Computations. F. H. Bigelow. *Extract from* Monthly Weather Review.
125	Wind Barometer Tables. *Extract from* Monthly Weather Review.
126	Clothing and Temperature. W. F. R. Phillips. *Extract from* Monthly Weather Review.
127	Tables for Obtaining the Temperature of the Dewpoint, Relative Humidity, etc.
130	The Equations of Hydrodynamics in a Form Suitable for Application to the Earth's Atmosphere. J. Cottier. *Extract from* Monthly Weather Review.
132	Instructions for use of Aneroid Barographs on the Great Lakes.
133	Instructions Governing the Corn, Wheat, Cotton, Sugar, and Rice Region Service.
134	Instructions to Operators on the United States Seacoast Telegraph Lines.
136	Bulletin D. Rainfall of the United States, with Annual, Seasonal, and Other Charts. A. J. Henry.
137	Monthly Report of the River and Flood Service for September, 1897.
138	United States Daily Atmospheric Survey. Willis L. Moore.
139	Report of the Chief of the Weather Bureau for 1897. 8vo edition.
140	Forest and Rainfall. H. A. Hazen.
142	The Probable State of the Sky Along the Path of the Total Eclipse of the Sun, May 28, 1900. F. H. Bigelow. *Extract from* Monthly Weather Review, 1897.
143	Bulletin E. Floods of the Mississippi River. Park Morrill.

[1] See MONTHLY WEATHER REVIEW, November 1902, 30: 528–530: and July 1915, 43: 346–350.

[2] Except MONTHLY WEATHER REVIEW SUPPLEMENT No. 34.

W. B. No. Title of publication

144 Monthly Report of the River and Flood Service for October, 1897.
145 The Highest Kite Ascensions at Blue Hill. S. P. Ferguson. *Extract from* Monthly Weather Review, 1897.
147 Monthly Report of the River and Flood Service for November, 1897. *Extract from* Monthly Weather Review.
148 An Improved Sunshine Recorder. D. T. Maring. *Extract from* Monthly Weather Review.
149 A Winter Barograph Curve from the South Pacific Ocean. *Extract from* Monthly Weather Review.
150 Bulletin No. 21. Abstract of a Report on Solar and Terrestrial Magnetism in Their Relations to Meteorology.
151 Monthly Report of the River and Flood Service for December, 1897. *Extract from* Monthly Weather Review.
153 Monthly Report of the River and Flood Service for January, 1898. *Extract from* Monthly Weather Review.
156 Monthly Report of the River and Flood Service for February, 1898. *Extract from* Monthly Weather Review.
158 Monthly Bulletin of the River and Flood Service for March, 1898. *Extract from* Monthly Weather Review.
159 Wrecks and Casualties on the Great Lakes during 1895, 1896, and 1897.
160 Monthly Bulletin of the River and Flood Service, for April, 1898. *Extract from* Monthly Weather Review.
162 Normal Annual Sunshine and Snowfall. *Extract from* Monthly Weather Review.
163 Bulletin No. 22. Climate of Cuba; also, A Note on the Weather of Manila. W. F. R. Phillips.
164 Monthly Bulletin of the River and Flood Service for May, 1898. *Extract from* Monthly Weather Review.
166 Circular K, Instrument Division. Instructions for Aerial Observers. C. F. Marvin.
167 Circular A, Instrument Division. Instructions for Obtaining and Tabulating Records from Recording Instruments. C. F. Marvin.
168 Investigation of the Cyclonic Circulation and the Translatory Movement of West Indian Hurricanes. Rev. B. Vines. *Extract from* Bulletin No. 11.
169 Bulletin of the River and Flood Service for June, 1898. *Extract from* Monthly Weather Review.
171 Moisture Tables. C. F. Marvin. *Extract from* Monthly Weather Review.
173 Monthly Bulletin of the River and Flood Service for July, 1898. *Extract from* Monthly Weather Review.
175 Monthly Bulletin of the River and Flood Service for August, 1898. *Extract from* Monthly Weather Review.
177 Monthly Bulletin of the River and Flood Service for September, 1898. *Extract from* Monthly Weather Review.
179 The Probable State of the Sky Along the Path of Total Eclipse of the Sun, May 28, 1900. *Extract from* Monthly Weather Review.
180 Aneroid Barometers. C. F. Marvin. *Extract from* Monthly Weather Review.
181 Report of the Chief of the Weather Bureau for 1898. 8vo.
182 Monthly Bulletin of the River and Flood Service for October, 1898. *Extract from* Monthly Weather Review.
184 Instructions for Voluntary Observers. 1899.
186 Bulletin No. 23. Frost. When to Expect it and How to Lessen the Injury Therefrom. W. H. Hammon.
187 Bulletin No. 24. Proceedings of the Convention of Weather Bureau Officials held at Omaha, Nebr., October 13–14, 1898. James Berry.
188 Climate and Crop Report. Season of 1898. Alaska Section. H. L. Ball. *Extract from* Monthly Weather Review.
191 Bulletin No. 25. Weather Forecasting. Some Facts Historical, Practical, and Theoretical. Willis L. Moore.
193 Circular E, Instrument Division. Measurement of Precipitation. C. F. Marvin.
194 Hydrology of the Lake Minnetonka Watershed. Geo. W. Cooley. *Extract from* Monthly Weather Review.
197 Bulletin No. 26. Lightning and the Electricity of the Air. A. G. McAdie and A. J. Henry. In two parts.
199 Property Loss by Lightning in 1898. A. J. Henry and A. G. McAdie.
201 Climatology of the Isthmus of Panama. H. L. Abbott. *Extract from* the Monthly Weather Review.
202 An Advance in Measuring and Photographing Sounds. B. F. Sharp. *Extract from* Monthly Weather Review.
203 Variations in Lake Levels and Atmospheric Pressure. *Extract from* Monthly Weather Review.
206 Report of the Chief of the Weather Bureau for 1899. 8vo.
208 Bulletin F. Vertical Gradients of Temperature, Humidity, and Wind Direction. (Kite Observations of 1898.) H. C. Frankenfield.

W. B. No. Title of publication

209 Bulletin No. 27. The Probable State of the Sky Along the Path of Total Eclipse of the Sun, May 28, 1900. Observations of 1899. F. H. Bigelow.
211 Bulletin No. 28. The Climate of San Francisco, Calif. A. G. McAdie and Geo. H. Willson.
213 Meteorological Chart of the Great Lakes. Summary for the Season of 1899.
219 Bulletin No. 29. Frost Fighting. A. G. McAdie.
221 Bulletin G. Atmospheric Radiation. F. W. Very.
223 Anemometer Tests. C. F. Marvin. *Extract from* Monthly Weather Review.
227 Daily River Stages. Part VI. For 1896, 1897, 1898, and 1899.
228 Tables of Daily Precipitation. H. C. Frankenfield.
231 Report of the Chief of the Weather Bureau for 1900. 8vo.
232 Bulletin H. West India Hurricanes. E. B. Garriott.
233 Circular D, Instrument Division. Anemometry. C. F. Marvin.
235 Psychrometric Tables. C. F. Marvin.
237 Meteorological Chart of the Great Lakes. Summary for the Season of 1900.
241 Circular F, Instrument Division. Barometers and Measurement of Atmospheric Pressure. C. F. Marvin. Second edition.
244 Meteorological Chart of the Great Lakes. No. 1. 1901.
248 Weather Bureau Exhibit at the Pan-American Exposition. Buffalo, N. Y., 1901. *Reprint from* Monthly Weather Review.
250 Instructions for Voluntary Observers. Second edition.
252 Circular G, Instrument Division. Instructions for the Care and Management of Sunshine Recorders. C. F. Marvin. Second edition.
254 The Solar Constant. F. W. Very. *Reprint from* Monthly Weather Review.
256 Bulletin No. 30. Loss of Life in the United States by Lightning. A. J. Henry.
258 Meterological Chart of the Great Lakes. No. 2. 1901.
262 Bulletin J. Wind Velocity and Fluctuation of Water Level on Lake Erie. A. J. Henry.
264 Meteorological Chart of the Great Lakes. No. 1. 1902.
265 Bulletin No. 31. Proceedings of the Second Convention of Weather Bureau Officials, held at Milwaukee, August 27–29, 1901.
267 Bulletin I. Eclipse Meteorology and Allied Problems.
268 Bulletin No. 32. Hurricanes: Especially Those of Porto Rico and St. Kitts. W. H. Alexander.
273 Studies on the Statics and Kinematics of the Atmosphere in the United States. F. H. Bigelow. *Reprint from* Monthly Weather Review.
277 Circular A, Instrument Division. Instructions for Obtaining and Tabulating Records from Recording Instruments. C. F. Marvin. Second edition.
280 Meteorological Charts of the Great Lakes, 1902.
285 Circular E, Instrument Division. Measurement of Precipitation. C. F. Marvin. Second edition.
286 Meteorological Chart of the Great Lakes, 1903.
288 Bulletin K. Storms of the Great Lakes. E. B. Garriott.
290 Studies on the Meteorological Effects of the Solar and Terrestrial Physical Processes. The Semidiurnal Periods in the Earth's Atmosphere. F. H. Bigelow. *Extract from* Monthly Weather Review.
292 Bulletin L. Climatology of California. Alexander G. McAdie.
294 Bulletin No. 33. Weather Folk-Lore and Local Weather Signs. E. B. Garriott.
298 Meteorological Chart of the Great Lakes. Summary for 1903.
300 Monthly Weather Review for December, 1903.
301 Climatic Charts of the United States.
303 Bulletin M. The Floods of the Spring of 1903 in the Mississippi Watershed. H. C. Frankenfield.
304 Instructions Governing the Corn, Wheat, Cotton, and Sugar and Rice Regions Service. Second edition.
309 Meteorological Chart of the Great Lakes, 1904.
311 Bulletin No. 34. Climate: Its Physical Basis and Controlling Factors. Willis L. Moore.
312 Invariability of our Winter Climate. William B. Stockman. *Reprint from* Monthly Weather Review.
314 On the General Circulation of the Atmosphere in Middle and Higher Latitudes. W. N. Shaw. *Reprint from* Monthly Weather Review.
316 Studies on the Circulation of the Atmosphere of the Sun and of the Earth. F. H. Bigelow. *Reprint from* Monthly Weather Review.

W. B. No.	Title of publication
320	Sunshine Tables; three parts.
322	Bulletin No. 35. Long-Range Weather Forecasts. E. B. Garriott.
324	Meteorological Chart of the Great Lakes. No. 2. 1904.
326	Bulletin N. Periodic Variation of Rainfall in the Arid Region. William B. Stockman.
327	Evaporation Observations in the United States. H. H. Kimball. *Reprint from* Monthly Weather Review.
333	Meteorological Chart of the Great Lakes, 1905.
334	Bulletin O. Temperature and Relative Humidity Data. William B. Stockman.
336	Improved Methods for Finding Altitude and Azimuth, Geographical Position, and the Variation of the Compass. G. W. Littlehale. *Reprint from* Monthly Weather Review.
338	Report of the Chief of the Weather Bureau for 1905.
339	Daily River Stages. Part VII. For the Years 1900, 1901, 1902, 1903, and 1904.
342	Bulletin No. 36. Relations between Climates and Crops. Cleveland Abbe.
344	Studies on the Diurnal Periods in the Lower Strata of the Atmosphere. F. H. Bigelow.
347	Circulars B and C (combined), Instrument Division, instructions for Cooperative Observers. C. F. Marvin. Third edition.
349	Bulletin No. 37. Recent Practice in the Erection of Lightning Conductors. Alfred J. Henry.
350	Meteorological Chart of the Great Lakes, 1905. No. 2.
355	Bulletin P. Cold Waves and Frost in the United States. E. B. Garriott.
356	Meteorological Chart of the Great Lakes, 1906.
361	Bulletin Q. Climatology of the United States. Alfred J. Henry.
364	Circular D, Instrument Division. Anemometry. C. F. Marvin. Third edition.
372	Studies on the Thermodynamics of the Atmosphere. F. H. Bigelow. *Reprint from* Monthly Weather Review.
375	Meteorological Chart of the Great Lakes, 1906. No. 2.
376	Meteorological Chart of the Great Lakes, 1907.
379	Report of the Chief of the Weather Bureau, 1906–7.
381	Bulletin of the Mount Weather Observatory. Vol. 1, Part 1.
388	Bulletin of the Mount Weather Observatory. Vol. 1, Part 2.
391	Bulletin of the Mount Weather Observatory. Vol. 1, Part 3.
395	Bulletin R. The Daily Normal Temperature and Precipitation of the United States. F. H. Bigelow.
397	Instructions to the Marine Meteorological Observers of the United States Weather Bureau.
400	Bulletin of the Mount Weather Observatory. Vol. 1, Part 4.
401	Circular F, Instrument Division. Barometers and the Measurement of Atmospheric Pressure. C. F. Marvin. Third edition.
403	Daily River Stages. Part VIII. For the years 1905 and 1906.
406	Bulletin of the Mount Weather Observatory. Vol. 2, Part 1.
408	Bulletin S. Report on the Temperatures and Vapor Tensions of the United States. F. H. Bigelow.
409	A Manual for Observers in Climatology and Evaporation.
412	Bulletin of the Mount Weather Observatory. Vol. 2, Part 2.
415	Instructions to Special River and Rainfall Observers.
418	Bulletin of the Mount Weather Observatory. Vol. 2, Part 3.
423	Studies on the Vortices in the Atmosphere of the Earth. F. H. Bigelow. *Reprints from* the Monthly Weather Review.
427	Bulletin of the Mount Weather Observatory. Vol. 2, Part 4.
428	Bulletin of the Mount Weather Observatory. Vol. 2, Part 5.
430	Bulletin of the Mount Weather Observatory. Vol. 2, Part 6.
432	Bulletin of the Mount Weather Observatory. Vol. 3, Part 1.
435	Bulletin No. 38. Mississippi River Levees and their Effect on River Stages during Flood Periods. S. C. Emery.
437	Bulletin of the Mount Weather Observatory. Vol. 3, Part 2.
439	Bulletin of the Mount Weather Observatory. Vol. 3, Part 3.
441	Bulletin of the Mount Weather Observatory. Vol. 3, Part 4.
443	Bulletin T. Frost and Temperature Conditions in the Cranberry Marshes of Wisconsin. H. J. Cox.
444	Instructions to Marine Meteorological Observers of the Weather Bureau. Third edition.
445	Circular E, Instrument Division. Measurement of Precipitation. C. F. Marvin. Third edition, and reprint of 1913.
447	Bulletin U. Temperature Departures, Monthly and Annual, in the United States. 1873 to 1909.
449	Bulletin V. Frost Data of the United States. P. C. Day.
450	Instructions for Operating the Hydrograph. Appendix to Circular A, Instrument Division. C. F. Marvin.
453	Daily River Stages. Part X. For the years 1909 and 1910. (The serial number was inadvertently omitted from Part IX, 1907 and 1908.)
454	Bulletin of the Mount Weather Observatory. Vol. 3, Part 5.
456	Circular G, Instrument Division. Instructions for the Care and Management of Sunshine Recorders. C. F. Marvin. Third edition.
457	Bulletin of the Mount Weather Observatory. Vol. 3, Title-page and Index.
459*	Circulars B and C (combined). Instrument Division. Instructions for Cooperative Observers. C. F. Marvin. Fourth edition.
459*	Bulletin of the Mount Weather Observatory. Vol. 4, Part 1.
462	Bulletin of the Mount Weather Observatory. Vol. 4, Part 2.
463	Bulletin No. 39. A course in Meteorology and Physical Geography. W. N. Allen.
466	Bulletin of the Mount Weather Observatory. Vol. 4, Part 3.
467	Bulletin No. 42. Forecasting the Weather. G. S. Bliss.
469	Instructions to Special River and Rainfall Observers. (Reprint.)
471	Bulletin No. 40. The Relation between the Precipitation over the Watershed of the Ohio River above and the Stream-flow below at Cincinnati. J. Warren Smith.
472	Circular F, Instrument Division. Barometers and the Measurement of Atmospheric Pressure. C. F. Marvin. Fourth edition.
473	Bulletin No. 41. Forecasting Frost in the North Pacific States. E. A. Beals.
476	Bulletin W. Summaries of Climatological Data by Sections. (Also issued in 104 separate parts without W. B. numbers.)
478	Bulletin of the Mount Weather Observatory. Vol. 4, Part 4.
480	Bulletin of the Mount Weather Observatory. Vol. 4, Part 5.
482	Bulletin of the Mount Weather Observatory. Vol. 4, Part 6.
483	Bulletin of the Mount Weather Observatory. Vol. 4, Title page and Index.
487	Bulletin X. Hurricanes of the West Indies. O. L. Fassig.
489	Bulletin of the Mount Weather Observatory. Vol. 5, Part 1.
492	Bulletin of the Mount Weather Observatory. Vol. 5, Part 2.
493	Instructions governing the Corn, Wheat, Cotton, and Sugar and Rice Region Service. Third edition.
494	Bulletin of the Mount Weather Observatory. Vol. 5, Part 3.
498	Bulletin No. 43. The Rivers and Floods of the Sacramento and San Joaquin Watersheds. N. R. Taylor.
499	Bulletin No. 44. The Climate of San Francisco. A. G. McAdie.
501	Bulletin of the Mount Weather Observatory. Vol. 5, Part 4.
503	Bulletin of the Mount Weather Observatory. Vol. 5, Part 5.
505	Bulletin of the Mount Weather Observatory. Vol. 5, Part 6.
507	Daily River Stages. Part XI. For the years 1911 and 1912.
509	Circular A, Instrument Division. Instructions for Obtaining and Tabulating Records from Recording Instruments. C. F. Marvin. Third edition.
511	Bulletin of the Mount Weather Observatory. Vol. 6, Part 1.
512	Brief List of Meteorological Text Books. C. F. Talman. (First edition, 1909; second edition, 1910; third edition, 1913.)
514	Bulletin of the Mount Weather Observatory. Vol. 5, Title-page and Index.
517	Bulletin of the Mount Weather Observatory. Vol. 6, Part 2.
518	Circular G, Instrument Division. Instructions for the Care and Management of Electrical Sunshine Recorders. Fourth edition.
519	Bulletin Y. The Ohio and Mississippi Floods of 1912. H. C. Frankenfield.
520	Bulletin Z. The Floods of 1913 in the Rivers of the Ohio and Lower Mississippi Valleys. A. J. Henry.
522	The Weather Bureau Kiosk. C. F. Marvin.
524	Bulletin of the Mount Weather Observatory. Vol. 6, Part 3.
526	Bulletin of the Mount Weather Observatory. Vol. 6, Part 4.
530	Circular D, Instrument Division. Instructions for the Installation and Maintenance of Wind Measuring and Recording Apparatus. Fourth revision.
532	Bulletin of the Mount Weather Observatory. Vol. 6, Part 5.
538	Monthly Weather Review. Supplement No. 1. Types of Storms of the United States and their Average Movements. E. H. Bowie and R. H. Weightman.
539	Circulars B and C (combined), Instrument Division. Instructions for Cooperative Observers. Fifth edition.
542	Papers on Frosts and Frost Protection in the United States. *Reprinted from* Monthly Weather Review, October 1914.
549	Daily River Stages. Part XII. For the years 1913 and 1914.
558	Monthly Weather Review. Supplement No. 2. Calendar of the common trees of the eastern United States, by G. N. Lamb; Phenological data by T. Mikesell at Wauseon, Ohio.
559	Circular L, Instrument Division. Instructions for the Installation and Operation of Class "A" Evaporation Stations. B. C. Kadel.

* (Serial number erroneously repeated.)

W. B. No.	Title of publication
579	Instructions to Special River and Rainfall Observers.
580	Tables for Computing Time of Moonrise and Moonset.
582	Daily River Stages, 1915. Part XIII.
583	Weather Forecasting in the United States.
584	Weather Code.
587	Instructions for the Care and Management of Storm-warning Stations.
592	Monthly Weather Review Supplement No. 3, Aerology No. 1. Sounding-balloon Ascensions at Fort Omaha, Nebr., May 8, 1915, etc.
598	Bulletin No. 42. Forecasting the Weather. Second edition. Geo. D. Bliss.
600	Monthly Weather Review Supplement No. 4. Types of Anticyclones of the United States and Their Average Movements. E. H. Bowie and R. H. Weightman.
603	Monthly Weather Review Supplement No. 5, Aerology No. 2. Free-air data at Drexel Aerological Station, February and March 1916.
609	Monthly Weather Review Supplement No. 6. Relative Humidities and Vapor Pressures over the United States, including a discussion of data from recording hair hygrometers for a period of about 5 years.
611	Daily River Stages, 1916. Vol. XIV.
612	Telegraph Code—West Indies and Caribbean Sea.
616	Radiographic Weather Code for Vessel Weather Observers.
619	Monthly Weather Review Supplement No. 7, Aerology No. 3. Sounding-balloon Ascensions at Fort Omaha, Nebr., May 8, 1915, etc.
637	Instructions for Installation and Use of Telethermoscope.
639	Instructions Governing Corn and Wheat, Cotton, Sugar, etc., services. Fourth edition.
641	Instructions to Operators of United States Weather Bureau Telegraph and Telephone Lines.
642	Monthly Weather Review Supplement No. 8, Aerology No. 4. Free-air data at Drexel Aerological Station, July to December 1916.
643	Monthly Weather Review Supplement No. 9. Periodical Events and Natural Law as Guides to Agricultural Research and Practice.
651	Monthly Weather Review Supplement No. 10, Aerology No. 5. Free-air data at Drexel Aerological Station, January to June 1917.
655	Tables for Dividing.
656	Daily River Stages, 1917. Vol. 15 (and 25 unbound sheets).
658	Monthly Weather Review Supplement No. 11, Aerology No. 6. Free-air data at Drexel Aerological Station, July to December 1917.
660	Monthly Weather Review Supplement No. 12, Aerology No. 7. Free-air data at Drexel Aerological Station and Ellendale, N. Dak., January to March 1918, and free-air temperatures during the cold winter of 1917.
663	Monthly Weather Review Supplement No. 13, Aerology No. 8. Free-air data at Drexel and Ellendale aerological stations, April to June 1918.
672	Monthly Weather Review Supplement No. 14, Aerology No. 9. Free-air data at Broken Arrow, Okla., Drexel, Nebr., Ellendale, N. Dak., and Royal Center, Ind., aerological stations, July to September 1918.
673	Circular B and C. Instructions to Cooperative Observers. Sixth edition.
678	Marine Meteorological Service of the United States.
687	Monthly Weather Review Supplement No. 15, Aerology No. 10. Free-air data at Broken Arrow, Okla., Drexel, Nebr., Ellendale, N. Dak., Groesbeck, Tex., Leesburg, Ga., and Royal Center, Ind. aerological stations.
689	Daily River Stages, 1918. Vol. XVI.
701	Monthly Weather Review Supplement No. 16. Predicting Minimum Temperatures from Hygrometric Data.
705	Radiographic Weather Code for Vessel Weather Observers.
712	Circular I, Instrument Division.
718	Daily River Stages, 1919. Vol. XVII.
731	Radiographic Weather Code for Vessel Reporters.
737	Bulletin No. 42. Weather Forecasting. Geo. S. Bliss.
740	Instructions for Aerological Observers. W. R. Gregg.
746	Circular J. Instructions for the Installation and Maintenance of Marvin Water-Stage Register, with specifications.
749	Monthly Weather Review Supplement No. 18. Bibliography of the Climate of South America. Margaret M. Welch.
757	Monthly Weather Review Supplement No. 17. Streamflow Experiment at Wagon Wheel Gap, Colo. C. G. Bates and A. J. Henry.
763	Daily River Stages, 1920. Vol. XVIII.
768	Monthly Weather Review Supplement No. 20. An Aerological Survey of the United States. W. R. Gregg.
771	Circular E, Instrument Division. Measurement of Precipitation. (Reprint.)
777	Daily River Stages, 1921. Vol. XIX.
780	Circular A (Instrument Division). Instructions for obtaining and Tabulating Records from Recording Instruments. Third edition.
784	Monthly Weather Review Supplement No. 21. The Preparation and Significance of Free-air Pressure Maps for the Central and Eastern United States. C. LeRoy Meisinger.
792	Monthly Weather Review Supplement No. 22. The Spring Floods of 1922. H. C. Frankenfield.
796	Monthly Weather Review Supplement No. 19. Thermal Belts and Fruit Growing in North Carolina. H. J. Cox.
802	Circular G, Instrument Division. Care and Management of Electric Sunshine Recorders.
805	Sunshine Tables. Parts I, II, and III.
811	Circular D, Appendix No. 2. Instructions for Wiring Meteorological Instruments.
813	Monthly Weather Review Supplement No. 23. The Temperature of Mexico. Jesus Hernandez.
814	Weather Code. Revised 1924.
819	Daily River Stages, 1922. Vol. XX.
838	Daily River Stages, 1923. Vol. XXI.
840	Monthly Weather Review Supplement No. 24. West Indian Hurricanes and Other Cyclones of the North Atlantic Ocean. Charles L. Mitchell.
843	Circulars B and C. Instructions for Cooperative Observers.
846	Instructions to River and Rainfall Observers. H. C. Frankenfield.
855	Monthly Weather Review Supplement No. 25. Normals of Daily Temperature for the United States. Charles F. Marvin and P. C. Day.
860	Radiographic Weather Code Book for Vessel Weather Observers. 1925.
862	Bulletin No. 42. Weather Forecasting. Geo. S. Bliss.
866	Circular M, Marine Division. Instructions to Marine Meteorological Observers.
869	Daily River Stages, 1924. Vol. XXII.
900	Monthly Weather Review Supplement No. 26. An Aerological Survey of the United States. Part II. Willis Ray Gregg.
902	Daily River Stages, 1925. Vol. XXIII.
906	Monthly Weather Review Supplement No. 27. Montezuma Pyrheliometry. Charles G. Abbot.
908	Aerological Code, 1926.
914	(This serial number not used.)
917	Monthly Weather Review Supplement No. 28. Climatological Data for the Tropical Islands of the Pacific Ocean (Oceania). W. W. Reed.
920	Daily River Stages, 1926. Vol. XXIV.
936	Monthly Weather Review Supplement No. 29. The Floods of 1927 in the Mississippi Basin. H. C. Frankenfield.
946	Monthly Weather Review Supplement No. 30. Forest and Streamflow Experiment at Wagon Wheel Gap, Colo. C. G. Bates and A. J. Henry.
950	Circular N, Aerological Division. Instructions for Airway Observers.
952	Monthly Weather Review Supplement No. 31. Climatological Data for Northern and Western Tropical South America. W. W. Reed.
956	Cloud Forms (book).
960	Daily River Stages, 1927. Vol. XXV.
961	Circular O, Aerological Division. Instructions for Making Pilot-Balloon Observations.
972	Weather Forecasting. Geo. S. Bliss.
991	Circular M, Marine Division. Instructions to Marine Meteorological Observers. Fifth Edition.

W. B. No.	Title of publication
993	Daily River Stages, 1928. Vol. XXVI.
995	Monthly Weather Review Supplement No. 32. Climatological Data for Southern South America. W. W. Reed.
999	Monthly Weather Review Supplement No. 33. Climate of Mexico. John L. Page.
1005	International Radio Weather Code for Use of United States Selected Ships, 1930.
1010	Circular F, Instrument Division. Barometers and the Measurement of Atmospheric Pressure.
1017	Aerological Code, 1930. Pilot Balloons.
1022	Circular P, Aerological Division. Instructions for Making Aerological Observations.
1024†	Monthly Weather Review Supplement No. 34. The Daily, Monthly, and Annual Normals of Precipitation in the United States.
1030	Daily River Stages, 1929. Vol. XXVII.
1038	Vessel Weather Code, 1931.
1043	Tables for Computing Horizontal Distance of Pilot Balloons, 1931.
1046	International Code for Radio Weather Reports from Ships.
1047	Weather Code, 1931.
1051	Circular Q. Pyrheliometers and Pyrheliometric Measurements.
1055	Daily River Stages, 1930. Vol. XXVIII.
1059	Circular N, second edition. Instructions for Airway Observers.
1071	Relative Humidity—Centigrade Degrees.
1091	Daily River Stages, 1931. Vol. XXIX.
1108*	Daily River Stages, 1932. Vol. XXX.
1110	Monthly Weather Review Supplement No. 35. Upper-air Wind Roses and Resultant Winds for the Eastern Section of the United States. Loyd A. Stevens.
1143	Daily River Stages, 1933. Vol. XXXI.
1151	Circular R. Preparation and Use of Weather Maps.
1170	Daily River Stages, 1934. Vol. XXXII.
1196	Daily River Stages, 1935. Vol. XXXIII.
1202	Monthly Weather Review Supplement No. 36. Winds in the Upper Troposphere and Lower Stratosphere over the United States. Loyd A. Stevens.
1221	Circular M. Instructions to Marine Meteorological Observers. 6th ed.

† Serial number was not printed on publication.
* Serial number erroneously repeated.

TABLE 1.—*Monthly Weather Review*

Vol. No.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
22													62
23	60	64	65	68	70	72	74	76	79	83	89	91	94
24	95	98	99	101	103	105	106	107	108	111	113	115	116
25	117	118	120	121	123	128	129	131	135	141	146	152	154
26	155	157	161	165	170	172	174	176	178	183	185	189	190
27	192	195	196	198	200	204	205	207	210	212	214	215	216
28	217	218	220	222	224	225	226	229	230	234	236	238	239
29	240	242	243	245	246	247	249	251	253	255	257	259	260
30	261	263	266	269	270	271	272	274	275	276	278	279	281
31	282	283	284	287	289	291	293	295	296	297	299	300	302
32	305	306	307	308	310	313	315	317	318	319	321	323	325
33	328	329	330	331	332	335	337	340	341	343	345	346	348
34	351	352	353	354	357	358	359	360	362	363	365	366	367
35	368	369	370	371	373	374	377	378	380	382	383	384	385
36	386	387	389	390	392	393	394	396	398	399	402	404	405
37	407	410	411	413	414	416	417	419	420	421	422	424	-----
38	425	426	429	431	433	434	436	438	440	442	446	448	-----
39	451	452	455	458	460	461	464	465	468	470	474	475	-----
40	477	479	481	484	485	486	488	490	491	495	496	497	-----
41	500	502	504	506	508	510	513	515	516	521	523	525	-----
42	527	528	529	531	533	534	535	536	537	540	541	543	-----
43	545	547	550	553	554	557	560	563	564	567	569	570	-----
44	572	575	577	581	586	589	591	594	596	599	602	605	-----
45	607	610	614	617	620	622	624	626	628	630	632	634	-----
46	636	640	644	647	648	653	659	661	664	666	669	671	-----
47	675	677	680	682	684	688	691	693	695	696	699	702	-----
48	704	706	707	709	711	713	715	717	721	723	725	728	-----
49	732	734	736	738	741	743	748	750	753	758	759	761	-----
50	764	766	769	772	775	778	781	782	786	789	790	793	-----
51	795	798	800	803	806	809	810	815	818	821	823	825	-----
52	826	829	831	833	836	839	841	845	848	850	852	854	-----
53	857	859	864	867	870	872	875	876	878	880	882	884	-----
54	886	888	891	893	895	897	899	903	905	909	911	913	-----
55	915	918	922	924	927	928	930	932	935	938	940	942	-----
56	944	945	951	954	957	959	963	965	967	969	971	974	-----
57	976	979	981	983	985	987	989	992	996	998	1001	1003	-----
58	1006	1008	1012	1014	1016	1019	1021	1025	1027	1029	1032	1034	-----
59	1036	1039	1041	1045	1048	1050	1053	1056	1058	1061	1062	1066	-----
60	1068	1072	1075	1077	1078	1080	1082	1084	1086	1088	1090	1093	-----
61	1096	1099	1100	1101	1104	1106	*1109	1111	1112	1115	1117	1119	-----
62	1121	1124	1126	1128	1130	1132	1134	1136	1138	1140	1141	1145	-----
63	1148	1150	1153	1156	1157	1160	1161	1163	1165	1167	1169	1171	-----
64	1173	1176	1178	1181	1183	1185	1187	1189	1190	1193	1195	1198	-----
65	1200	1203	1205	1207	1210	1212	1214	1215	1217	1220	-----	-----	-----

* Serial number erroneously repeated.

TABLE 2.—*Climatological data for the United States by sections*

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1914													551
1915	544	546	548	552	555	556	561	562	565	566	568	571	576
1916	573	574	578	585	588	590	593	595	597	601	604	606	615
1917	608	613	618	621	623	625	627	629	631	633	635	638	650
1918	645	646	649	652	654	657	662	665	667	668	670	674	685
1919	676	679	681	683	686	690	692	694	697	698	700	703	719
1920	708	710	714	716	720	722	724	726	727	729	730	733	745
1921	735	739	742	744	747	751	752	754	755	756	760	762	770
1922	765	767	773	774	776	779	783	785	787	788	791	794	801
1923	797	799	804	807	808	812	816	817	820	822	824	827	832
1924	828	830	834	835	837	842	844	847	849	851	853	856	863
1925	858	861	865	868	871	873	874	877	879	881	883	885	889
1926	887	890	892	894	896	898	901	904	907	910	912	916	921
1927	919	923	925	926	929	931	933	934	937	939	941	943	949
1928	947	948	953	955	958	962	964	966	968	970	973	975	977
1929	978	980	982	984	986	988	990	994	997	1000	1002	1004	1009
1930	1007	1011	1013	1015	1018	1020	1023	1026	1028	1031	1033	1035	1040
1931	1037	1042	1044	1049	1052	1054	1057	1060	1063	1064	1065	1057	1059
1932	1070	1073	1074	1076	1079	1081	1083	1085	1087	1089	1092	1094	1095
1933	1097	1098	1102	1103	1105	1107	*1108	*1100	1113	1114	1116	1118	1120
1934	1122	1123	1125	1127	1129	1131	1133	1135	1137	1139	1142	1144	1147
1935	1146	1149	1152	1154	1155	1158	1159	1162	1164	1166	1168	1172	1180
1936	1174	1175	1177	1179	1182	1184	1186	1188	1191	1192	1194	1197	1199
1937	1201	1204	1206	1208	1209	1211	1213	1216	1218	1219	-----	-----	-----

* Serial number erroneously repeated.

While the above lists embrace the vast majority of Weather Bureau publications, there are a few of general interest that have not received serial numbers, such as—

Proceedings of the Third Convention of Weather Bureau Officials held at Peoria, Ill., September 20–22, 1904. Washington, 1904. 267 pp. 8vo.

Climatological Data, for each of 46 sections, monthly. 8pp. 4°. (Chiefly published at section centers. A separate issue of text and tables appears since January 1914, in corresponding sections of *Climatological Data for the United States by Sections*, as listed under W. B. No. 544 and elsewhere.)

Weekly Weather and Crop Bulletin, monthly or weekly. 4–8 pp. 4°.

Snow and Ice Bulletin, with chart, weekly during the winter. f°. (This bulletin was merged with the *Weekly Weather and Crop Bulletin* in 1932.)

The Weather Bureau. Reissued from time to time. Latest edition, 1931.

Explanation of the Weather Map. n. d. 4 pp. 8vo.

Various climatological charts.

Publication of the MONTHLY WEATHER REVIEW began with the year 1873, but volume numbers first appeared in the issue for February 1883 which was designated as vol. 11, No. 2; the first title page was for vol. 14, 1886. The issues for the 27 years 1883 to 1909, inclusive, comprise volumes 11 to 37, one volume to each year. Each volume usually consists of 12 monthly numbers; an Annual Summary and annual index were first given for vol. 17, 1889, and in vol. 21, 1893, the Annual Summary was advanced to a separate, thirteenth, part of which appeared annually thereafter until omitted from vol. 37, 1909. One volume of the REVIEW has appeared each year to date, the issues for 1937 comprising vol. 65; the volumes for 1910 to 1913, inclusive, are so bulky, however, as to necessitate binding each in two parts.

Each monthly number of the REVIEW carries the weather data and climatological statistics for the month named on the cover. Since about 4 weeks are required to assemble these data after the close of the month to which they pertain, and further time is consumed in the process of publication, a given issue commonly appears about 2½ months after the close of the month named on its cover.

PRELIMINARY REPORT ON OBSERVATIONS OF AIR CELLS IN SNOWFLAKES AND IN OTHER FORMS OF ICE

By CHARLES M. HECK

[North Carolina State College, University of North Carolina, Raleigh, N. C., September 1937]

Examining snowflakes that were in the process of melting immediately after they had fallen, early in the spring of 1936, the writer observed that when the melting line through a snowflake reached one end of a long, regular air cell in the flake and punctured its wall, water ran up into the air cell for approximately 40 percent of its length. The facilities for observation during that snowfall were not very good, but the striking fact was noted that the air in all cells showed practically this same 40 percent contraction.

This phenomenon is of considerable physical interest, and also suggests a possibility of practical application. If the principal cause of the contraction of the air in the cells is the higher barometric pressure at the earth's surface, then from the standard hypsometric formula the height at which the snow was formed may be inferred; it was hoped that further investigation would indicate what corrections would have to be introduced for temperature change, vapor pressure, and capillarity.

No more snows in 1936, and only one in 1937, presented opportunity for further observations In the 1937 snow, consistent values of 36 percent were found for the contraction of the air in the cells. In the meantime, observations were begun on air cells in other forms of ice.

Air cells in the following three forms of ice have been examined: (1) Ice formed in variously shaped concrete vessels, (2) thin ice layers formed over puddles, (3) ice columns rising from the ground on cold nights.

Six massive cement blocks were cast, with cavities in the form of a circle, an ellipse, a square, a rectangle, a triangle, and a six-pointed star; six others were also cast with dimensions one-third those of the first six. Each of the cakes of ice slowly frozen in these cavities during cold nights formed characteristic patterns of long air cells throughout the volume. These patterns were suggestive of stress lines developed during freezing, and varied somewhat with the rate of freezing. Photographs were made of the patterns, but a more accurate control of freezing conditions is needed before results are reproducible. The air in these cells showed no contraction on melting.

Air cells in thin ice layers are likewise not observed to contract on melting, but the shapes these air cells take are found to be very characteristic. Instead of being straight and regular, they tend to bend at one or more points at an angle of approximately 120°. The natural assumption is that the air has been expelled to the edge of the ice crystal during freezing, and the 120° angles are found at the points where the air cells along two edges of a crystal meet. Observations under high magnification on the freezing of water at an interface with a mineral oil, showed the formation of ice under these conditions to be the result of a number of more or less distinct steps, and the formation of air cells was visibly associated with only the last of these steps. H. T. Barnes [1] has photographed one of the intermediate steps in the formation of ice on a free water surface; the winter's observations under the above conditions showed what Barnes called "colloidal ice" particles to be elongated rather than circular as shown in Barnes' photograph. These phenomena are to be further studied and photographed; they are mentioned to show that it is unsafe to assume too much simplicity in the manner in which air cells may be formed in ice.

The columns of ice often forced up from the ground on cold nights are found to be filled with many long, parallel air cells. Those observed were not as regular as the air cells in snow, and varied much more in diameter among contiguous parallel cells. When a line of melting punctures one end of one of these air cells, an air bubble immediately starts to form as though the pressure of the air within were slightly greater than that of the external atmosphere. Since the capillary pressure in the bubble must be less than that in the air cell, and grow still less as the bubble grows greater, the bubble naturally tends to grow larger. This causes a break in the air column about the middle of the length of the remaining air cell. The air bubble then separates from the air cell, and water runs up into the air cell half or more of its length. Thus the phenomena observed in air cells of melting frost columns are entirely different from those found in air cells of melting snowflakes; the former seem to have an excess air pressure, while the latter have a deficiency of pressure relative to the surrounding air.

The Weather Bureau has cooperated with the writer by arranging for observations of air cells in snowflakes at three Weather Bureau stations where the aid of university physics departments may be obtained. A few preliminary results that have been reported have corroborated the peculiar contraction of the air in the cells of snowflakes, and have given values between the 36 percent and 40 percent originally found. Means for artificially producing snow have also been devised for this study.

Correspondence and cooperation with the author on the part of any who may wish to observe air cells in snow or ice are invited.

[1] H. T. Barnes, *Ice Engineering*, p. 8.

FURTHER OBSERVATIONS ON THE NORTH AMERICAN HIGH-LEVEL ANTICYCLONE

By THOMAS R. REED

[Weather Bureau, San Francisco, Calif., July 1937]

Four years ago the author [1] drew attention to the existence in summer of a thermally-induced anticyclone in the upper air over the North American continent, and showed how it was related to certain aspects of weather in the western United States, such as the prevailing temperature inversion over the south Pacific Slope, the occurrence of "Sonora" and "Arizona" type rains in the Far Southwest, and the occasional prevalence of summer thundershowers in other parts of the normally dry Far West. The study was based on 3 years' collection of upper-wind statistics for the United States, and utilized resultant wind data for the 4,000 meter level as published in the MONTHLY WEATHER REVIEW for the years 1930, 1931, and 1932. The present study incorporates similar data which have

[1] Thomas R. Reed, "The North American High Level Anticyclone," MONTHLY WEATHER REVIEW, November 1933, vol. 61: 321-325.

accumulated since the first study was made, and embraces upper wind statistics for the period 1930–36, inclusive. The study, of course, deals only with the warmer months, June, July, August, and September, of each year, making a total of 28 months in all.[2]

The first fact to impress one in a survey of resultant wind charts for these months is the preponderance of times at which the anticyclone was centered east of the Rocky Mountains. In the 28 months considered it was found east of the Divide for 21 of them. In the other 7 months it was either centered west of the Divide or was too feebly developed to be classified.

Another feature, and one of some significance, was the evident association of the anticyclonic crest with an area of deficient rainfall underneath: 15 times out of the 21 in which its crest lay east of the Rockies a droughty condition prevailed over large parts of the Middle West or South; whereas in nearly every case in which the crest lay west of the Rockies, normal or above normal rainfall was recorded to the eastward of them. Considering the 14 midsummer months alone (July and August), there were 12 in which the crest lay east of the Rockies, and for 9 of them subnormal rainfall was recorded over wide areas.

In the endeavor to account for the exceptions, i. e., the nonoccurrence of drought when the position of the upper level anticyclone seemed to call for it, resultant wind data for the 2,000-meter level were examined; and significant results were obtained. This circulation, more or less associated with the North Atlantic anticyclone, is normally independent of the high-level anticyclone over the continent, and the two cells are geographically rather far apart. However, when drought conditions over large areas are accentuated, the two cells are found nearer together. In the 12 cases considered, only one exception to this rule was found and that was in August 1932, when the upper-level anticyclone was very poorly developed A fair inference would seem to be that when these two systems (one represented by winds at 4,000 meters and the other by winds at 2,000 meters) are widely separated, normal or above normal rains will be the rule, but that when they are close together the situation is favorable for drought.

There are ample physical explanations for the observed phenomena. For one, the subsidence going on in the high-level anticyclone is no doubt important. It is often in itself enough to account for the drought-producing lapse rate of temperature, characteristic of the rainless season in the Far West; Petterssen ascribes to it the existence of the so-called Ts air. He says:[3]

> This high-level anticyclone should be regarded as an independent cell between the Atlantic and Pacific cells of the general circulation. This new continental cell at high levels differs from the ordinary subtropical cells in the respect that it spreads above both the neighboring cells. This continental cell is undoubtedly responsible for the production of the warm and dry air aloft, which meteorologists usually call Ts.

The seeming inconsistency of describing the anticyclone as thermally induced and then making it responsible for warm and dry air aloft is satisfied by the explanation that, while warming below is requisite for its inception and maintenance, warming in the upper levels—once it has been formed—may be attributable to subsidence.

When the high-level anticyclone is well established over the Middle West or South, presumably this Ts air overspreads an abnormally large continental area, inducing a thermal structure resistant to convective processes.

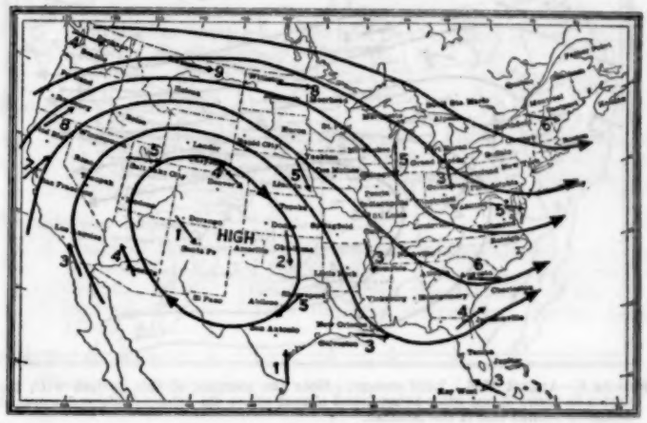

FIGURE 1.—August 1931. Resultant winds at 4,000 meters showing HIGH over Far Southwest.

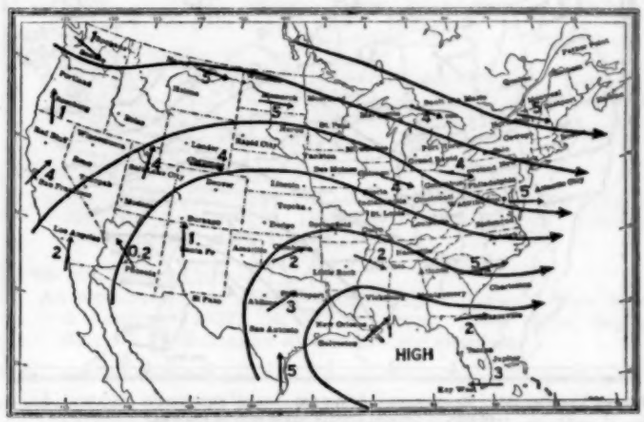

FIGURE 2.—August 1931. Resultant winds at 2,000 meters showing HIGH far to the Southeast. Note wide separation of this system with that shown in figure 1; rainfall was near or above normal east of Rockies with marked excess in Mississippi Basin.

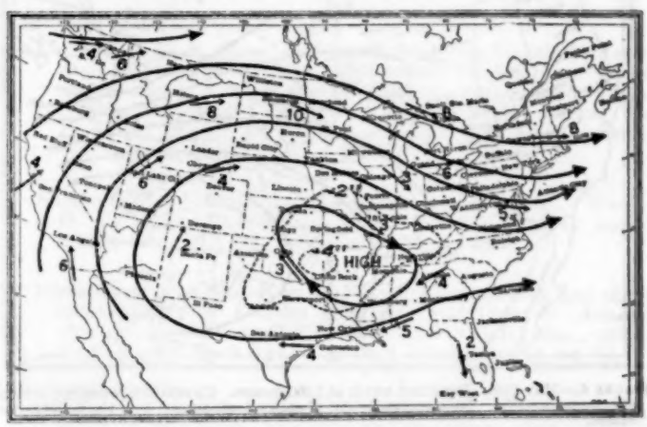

FIGURE 3.—August 1936. 4,000 meters. HIGH is over the Mississippi Valley.

It is not to be supposed, however, that the high-level circulation is all important. Air-mass movements below must be considered, and for this study the drift of air around the North Atlantic HIGH is fundamental. The relation of the North Atlantic HIGH to hot spells and droughts in the central and eastern United States has

[2] As in the previous study, the resultant wind data were plotted on charts, one chart for each month, after which stream lines were sketched in to represent roughly the mean air flow for the month over the entire region. In each case the flow was found to be anticyclonic with a fairly well implied crest or dome in the central area. Also, as before, data for the 4,000-meter level were employed as they yield the most consistent results for the country as a whole. Wind flow at lower levels is subject to more or less deformity due to the height of western mountain ranges, while data for the 5,000-meter level are less complete.

[3] Sverre Petterssen "On the Causes and Forecasting of California Fog," Journal of Aeronautical Sciences, 3: 306, July 1936.

long been recognized by meterologists, but only in recent years have mean values for the free-air circulation around its western extremity become available, and for the present purpose they yield results which surface data do not. Air trajectories implied by resultant wind data at the 2,000-meter level reveal the withdrawal or encroachment, the strengthening or enfeeblement, of the North Atlantic HIGH more clearly than do surface data, and they also facilitate analysis of the relationship of the North Atlantic HIGH to drought conditions in connection with the high-level anticyclone.

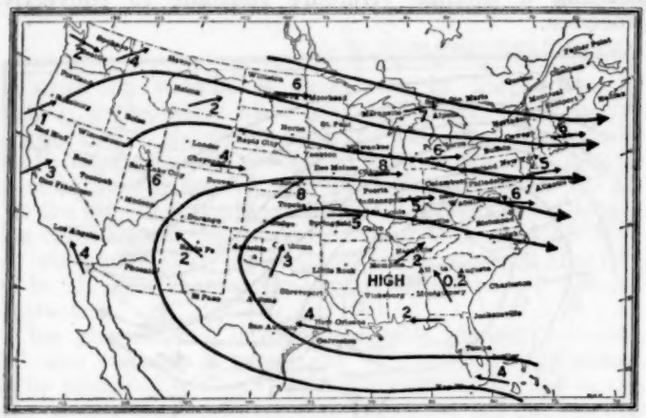

FIGURE 4.—August 1936. 2,000 meters. Note the merging of this system with that shown in figure 3; one HIGH being found almost above the other. This was a notably droughty month east of the Rockies.

FIGURE 5.—May 1935. Resultant winds at 2,000 meters. Circulation preceding a summer of nearly normal precipitation east of Rockies.

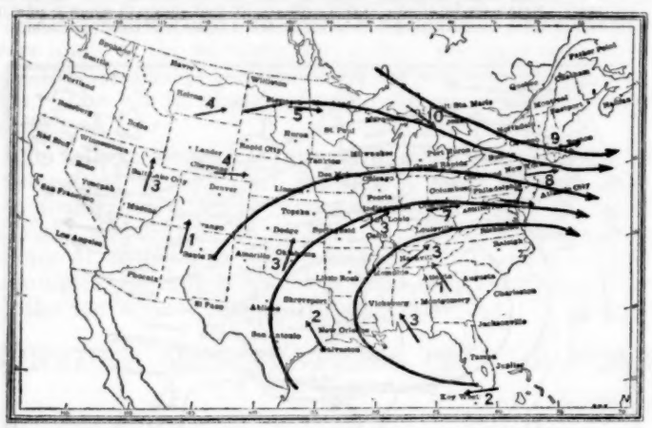

FIGURE 6.—May 1936. Resultant winds at 2,000 meters. Circulation preceding summer of extreme drought. Note encroachment of anticyclonic system over the Southeastern States.

It should not seem surprising to find that when these two systems overlap each other the least, droughts are least likely, for at such times the development of frontal disturbances between them is favored. The reverse, however, would naturally be the case when the two systems are located one above the other, for then, in addition to the "deck" of Ts air aloft, there is a uniformity of circulation at all levels tending to stagnation and unfavorable to frontal phenomena.

Contrasting situations indicative of the foregoing are represented on the charts for August 1931 (figs. 1 and 2) and August 1936 (figs. 3 and 4). Note that in August 1931, the high-level anticyclone is centered over the southern Rockies and scarcely overlaps the Atlantic anticyclone at all. This was a month of normal or supernormal rainfall east of the Continental Divide. In contrast to this is the coincidence of the two systems shown on the charts for August 1936. Here the anticyclonic circulation at the 2,000-meter level has invaded the continent as far west as the Rockies, while the high-level anticyclone is centered over Arkansas. This was a month of marked rainfall deficiency in the Middle West, with a defect of 2 inches or more throughout Missouri, Arkansas, Oklahoma, and parts of the adjoining States. Many examples like the foregoing can easily be found; those who wish to pursue the investigation are invited to examine in particular free air winds and attendant rainfall situations for the months of June and July 1936 (unusual droughts), and for June 1935 and July 1931, for opposite regimes.

Two exceptions to the foregoing rule are to be noted, both occurred in the month of September, once in 1933 and again in 1936. In both these months there was a marked overlapping of the two systems, but in each case the abnormality lay in the high-level system which was so far southeast of its usual position that its crest was over the East Gulf States. In both these instances there was an area of subnormal rainfall underneath the crest, but the periphery was marked by abundant rains, above normal precipitation being recorded over a wide belt extending from Texas to the Great Lakes, a fact not at all inconsistent, since the mean circulation implied a vast importation of Tg air over the belt mentioned.

Upper-wind data for the month of May seem to have some association with the type of weather during the ensuing summer. In this connection, the circulation at the 2,000-meter level is of especial interest. When the circulation at this level in May implies a normal flow (fig. 5) of air around the Atlantic high-pressure belt there is apparently less likelihood of drought in the following months than when it shows marked aberrations (fig. 6). In the inclusive period 1930–36 there was only one case in which this indication failed; that was in 1930, which was a droughty season although the May circulation did not appear to be seriously deranged. On the other hand, the droughts of 1934 and 1936, and the more normal seasons of 1931, 1932, 1933, and 1935 were fairly well presaged.

BIBLIOGRAPHY

[RICHMOND T. ZOCH, in charge of Library]

By AMY D. PUTNAM

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

American national red cross.

First aid for flooded homes. Washington, D. C. [n. d.] [29] p. 27 cm.

Bleeker, W.

Meteorologisches zu den drei holländischen Karakorum-Expeditionen. Amsterdam. 1936. 27 p. figs., tables. 26 cm. [Repr. from Proc., v. 39, nos. 6, 7, & 8, 1936.] At head of title: K. akademie van wettenschappen te Amsterdam.

Crowther, James Gerald.

Famous American men of science. New York. [°1937.] XVI, 19–414 p. front., illus., plates, ports. 22 cm. (Benjamin Franklin, Joseph Henry, Josiah Willard Gibbs, Thomas Alva Edison.)

Curme, George Oliver.

A grammar of the German language, designed for a thoro and practical study of the language as spoken and written to-day. Rev. & enl. New York & London. 1922. XII, 623 p. 26 cm.

Dietrich, Günter.

Die Lage der Meeresoberfläche im Druckfeld von Ozean and Atmosphäre, mit besonderer Berücksichtigung des westlichen Nordatlantischen Ozeans und des Golfs von Mexiko. II. Über Bewegung und Herkunft des Golfstromwassers. Berlin. 1937. 91 p. figs., tabs., diagrs. 26 cm. [At head of title: Veröffentlichungen des Instituts für Meereskunde. Neue Folge. A. Geogr.-naturwissenschaftliche Reihe. Heft 33. Januar 1937.]

Dufour, Louis.

Étude du vent géostropique et du vent de gradient à Uccle. 1937. 10 p. figs., tabs. 24 cm. [At head of title: Extrait du bulletin "Ciel et terre." No. 1, 1937.]

Fisher, R. A.

The design of experiments. 2d ed. Lond. 1937. 260 p. tabs., diagrs. 22½ cm.

Fisher, Ronald Almer.

Statistical methods for research workers. 6th ed., rev. & enl. Edinburgh & London. 1936. XIII, 339 p. tables (part fold.), diagrs. 22½ cm.

Hawke, Eric Ludlow.

Buchan's days; a modern guide to weather wisdom. London. [1937.] 231 p. front. (port.), illus., diagrs. 19½ cm. Illustrated lining-papers.

Herchenroder, M.

The atmospheric pressure at Mauritius, being a survey an discussion of fifty-six years' observations made at the Royal Alfred observatory. Port Louis. 1937. 21 p. tabs., fold. diagrs. 25 cm. [At head of title: R. A. observatory publications, no. 18.]

International union of pure and applied physics.

Reports on symbols, units & nomenclature, approved by the general assembly of the union at its meeting in London on 5th October 1934. London. 1935. 40 p. diagr. 25½ cm. At head of title: International conference on physics, London, 1934.

Jackson, S. P.

The climate of Johannesburg: rainfall in the winter months. Johannesburg. 1935. [p. 43–58]. figs., tabs., diagrs. 24 cm. [The South African geographical journal, v. XVIII. Dec. 1935.]

Kilcawley, Edward James.

Weathering resistance of concrete. Troy, N. Y. [1937.] 83 p. illus., tabs., diagrs. 22½ cm. (On cover: Rensselaer polytechnic institute bulletin. Engineering and science series. no. 53.)

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Lehmann, Ernst August, & Adelt, Leonhard.

Zeppelin, the story of lighter-than-air craft. Translated by Jay Dratler; with a preface and final chapter by Commander Charles E. Rosendahl. London, New York [etc.]. 1937. x, 365 p. front., plates, ports. 22 cm. ("1st edition.")

Maurain, Charles Honoré.

Magnétism et électricité terrestres. Paris. 1935. diagrs. 25 cm. (Physique du globe; exposés pub. sous la direction de Ch. Maurain. I. Actualités scientifiques et industrielles. 287.)

Namekawa, Tadao.

A study of the minor fluctuation of the atmospheric pressure. Parts I–V. Kyoto. 1934–1936. v. p. figs., maps, tables, diagrs. 26 cm. [Reprinted from the Memoirs of the College of science, Kyoto imperial university. Series A. v. 17–19, *passim*.]

Negretti & Zambra.

Standard meteorological instruments. List M3. Brussels, etc. 135 p. ill. 25½ cm. [1937?]

Pekeris, C. L.

Atmospheric oscillations. London. 1937. p. 650–671. figs., table. 25½ cm. [Repr.: "Proc. Royal socy. of London." Series A, no. 895, v. 158. Feb., 1937.

Schakleton, Edward.

Arctic journeys; the story of the Oxford university Ellesmere land expedition, 1934–5. Preface by the Rt. Hon. the Lord Tweedsmuir. London. [1937.] xv, 372 p. front., illus., plates (1 fold.), ports, fold. map. 23 cm.

Störmer, Carl.

Altitudes and spectra of red and sunlit auroras. St. Albans. 1937. 2 p. 22 cm. [Reprinted from Nature, London, v. 139, p. 584, April 3, 1937.]

Trewartha, Glenn Thomas.

An introduction to weather and climate. 1st ed. New York & London. 1937. ix, 373 p. front., illus., maps, tables, diagrs. Bibliography at end of some chapters.

True, Alfred Charles.

A history of agricultural experimentation and research in the United States 1607–1925 including a history of the U. S. Department of agriculture. Wash., D. C. 1937. vi, 321 p. front., illus., ports. 23 cm. (Miscellaneous pubn. no. 251.) Bibliography: p. 278–295.

U. S. Coast and geodetic survey.

Catalog of U. S. Coast and geodetic survey nautical charts, coast pilots, tide tables, current tables, tidal current charts, airway maps, Atlantic and Gulf coasts, Puerto Rico, Virgin islands, and the Canal zone; Pacific coast, Alaska, the Hawaiian islands and Guam and the Philippine islands. Washington, D. C. 1937. 1 v. 1937. charts.

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Earthquake investigations in California, 1934–1935. Wash., D. C. 1936. ix, 231 p. illus., facsims., diagrs., maps, tables, etc. 23½ cm. (Special pubn. no. 201.)

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Elements of map projection with applications to map and chart construction, by Charles H. Deetz and Oscar S. Adams. (4th ed., revised April 2, 1934.) 200 p. incl. illus., tabs., diagrs., maps (part fold.) 29 cm. (Special pubn. no. 68.)

U. S. Forest service.

Forests and water in the light of scientific investigation, by Raphael Zon. Washington, D. C. 1927. 106 p. incl. charts, tables. 23½ cm. Reprinted with revised bibliography, 1927, from Appendix v of the Final report of the National waterways commission, 1912. (Senate document no. 469, 62d Congress, 2d session.) "Bibliography on the relation of forests to water and climate:" p. 70–106.

U. S. Library of Congress. Union catalog.

Key to symbols used in the Union catalog. Rev. ed. Wash., D. C. 1936. v. 42 p. 23 cm.

U. S. Weather bureau.

Our climate. Useful information regarding the climate between the Rocky mountains and the Atlantic coast, with special reference to Maryland and Delaware. Prepared by John R. Weeks, meterologist, Baltimore, Md. Issued by the Maryland State Weather service, Edward B. Mathews, director, in cooperation with the U. S. Weather bureau, Willis R. Gregg, chief. 5th ed., rev., June 1935. [Baltimore, 1935.] 62 p. incl. illus., tables, charts, diagrs. 23 cm. "List of books and publications:" p. 15.

Uyeda, R., Oka, Y., & Terashima, M.

Notes on correlations between the upper wind and the meteorological elements. Tokyo. 1935. [p. 107–147.] figs., tables, diagrs. 26½ cm. [From: Tokyo. Imperial university. Journal of the Faculty of science. Sect. 1, v. III, pt. 2.]

Visser, C.

Die Frequenz der Sonnenhalo-Beobachtungen in den Niederlanden, besonders von 1914–1931. (Auszug.) 's Gravenhage. 1936. 95 p. plate, tables, diagrs. 24 cm. At head of title: Koninklijk Nederlandsch Meteorologisch Instituut, no. 102.

Weems, Philip Van Horn.

Air navigation. 1st ed. New York & London. 1931. xiii, 589 p. incl. front., illus., diagrs. 23½ cm. Bibliography: p. 569–572.

Witterstein, Franz.

Kleinklimatische Untersuchungen im Rheingau. Wiesbaden. 1936. [p. 59–103.] fold. map, tables, diagrs. 22½ cm. [Jahrbuch Nass. Ver. Naturk. Band 83, Wiesbaden, 15 März, 1936.]

Wüst, Georg.

Kuroshio und Golfstrom: eine vergleichende hydrodynamische Untersuchung. Berlin. 1936. 63 p. illus., maps (part fold.), tables, diagrs. 26 cm. At head of title: Veröffentlichungen des Instituts für Meereskunde an der Universität Berlin. Neue Folge. A. Geograph.-naturwissen. Reihe. Heft 29. Mai 1936.

SOLAR OBSERVATIONS

SOLAR RADIATION OBSERVATIONS DURING OCTOBER 1937

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Table 1 shows that solar radiation intensities averaged slightly above normal for October at both Washington and Madison, and slightly below normal at Lincoln and Blue Hill.

Table 2 shows a deficiency in the total amount of solar and sky radiation received on a horizontal surface at all stations with the exception of Lincoln, Fresno, Miami, Riverside, and Blue Hill.

Polarization measurements made at Madison on 4 days give a mean of 59 percent with a maximum of 60 percent on the 13th. Both these values are below the corresponding October normals. A value of 16.2 percent obtained on the 7th is omitted from the means owing to the fact that the sky was nearly covered with cirro stratus at the time the readings were made.

TABLE 1.—*Solar radiation intensities during October 1937*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 7	16.20			1.01	1.14	1.48					7.29
Oct. 8	4.17		0.80	1.01	1.19	1.46					3.99
Oct. 12	8.48						1.12				7.87
Oct. 15	3.81		.82	.99	1.14						3.99
Oct. 16	4.37			.91	1.16						3.00
Oct. 19	13.61						1.18				15.65
Oct. 25	4.37	0.75	.87	1.03	1.22		1.18				3.45
Oct. 29	9.14			1.10	1.24						3.99
Oct. 30	5.79	.70	.79	.85	.97						7.29
Means		(.72)	.82	.99	1.15	(1.47)	1.16				
Departures		−.03	−.03	+.02	+.01	+.05	+.03				

TABLE 1.—*Solar radiation intensities during October 1937*

[Gram-calories per minute per square centimeter of normal surface]

MADISON, WIS.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 6	5.16				1.27						6.02
Oct. 7	3.81		1.04	1.11	1.29						5.16
Oct. 12	6.27						1.37				3.63
Oct. 13	2.62				1.39						2.74
Oct. 14	2.49						1.38				3.00
Oct. 15	3.63			.99							3.63
Oct. 27	4.95						1.38				5.36
Oct. 29	5.79		.94	1.11	1.29						7.57
Means			(.99)	1.07	1.31		1.20				
Departures			+.07	+.02	+.11		+.12				

LINCOLN, NEBR.

Oct. 3	8.48	0.72	0.83	0.99	1.18	1.35					10.21
Oct. 4	12.24					1.38	1.16	0.94	0.80	0.65	12.68
Oct. 5	10.59				1.22	1.47	1.30	1.09	.94	.83	7.87
Oct. 7	4.57					1.53	1.34	1.15	1.02	.92	4.75
Oct. 21	4.57		.78								3.63
Oct. 31	3.45			.90	1.14						7.57
Means		(.72)	(.80)	(.94)	1.18	1.43	1.27	1.06	.92	.80	
Departures		−.11)	−.13)	−.15	−.10	−.07	+.02	−.02	−.02	−.03	

BLUE HILL, MASS.

Oct. 1	8.6					1.25	1.01				9.0
Oct. 2	10.7				1.20	1.20	1.10	0.91			7.4
Oct. 5	10.7				1.12	1.29	1.21	1.04			11.9
Oct. 8	4.6	1.02	1.08	1.16	1.29	1.44	1.22				3.8
Oct. 9	3.5	1.00	1.09	1.18	1.30	1.44					2.8
Oct. 13	6.3				1.15	1.43	1.21				4.2
Oct. 14	3.0			1.13	1.23	1.37					2.0
Oct. 15	3.3	.82	.96	1.15	1.31	1.49	1.30	1.21	1.14		2.6
Oct. 16	3.3	.75	.89	1.07	1.28	1.40	1.33	1.23	1.15	1.08	3.0
Oct. 17	3.0		.90	1.04	1.23						3.5
Oct. 21	6.1		.77	.96	1.20		1.12	1.04	.96	.93	5.4
Oct. 24	6.3						1.14				5.0
Oct. 25	3.6	.75	.86	1.02	1.11						4.4
Oct. 26	4.4	.78	.88	1.00	1.14	1.32	1.15	1.07			6.1
Oct. 31	4.6	.92	1.04	1.13	1.26	1.40	1.26	1.10			3.2
Means		.86	.94	1.08	1.22	1.37	1.19	1.09	1.08	1.00	
Departures		−.03	+.06	+.18	+.23	−.11	−.07	−.05	−.03	−.03	

[1] Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	San Juan	Friday Harbor	Ithaca	Newport
	Gram-calories per square centimeter																
1937	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 1	215	236	357	230	240	468	117	367	404	422	244	378	275	466	297	188	255
Oct. 8	221	301	276	215	218	406	167	311	414	412	312	388	293	596	259	158	262
Oct. 15	243	172	145	125	232	392	91	252	321	386	269	375	288	209	175	140	279
Oct. 22	205	227	294	189	170	359	108	284	191	372	367	352	191	449	124	94	194
	Departures from weekly normals																
Oct. 1	−116	−39	+23	−12	−40	+30	+7	−17	.....	+14	−90	+2	−43	.....	+17	−73	.....
Oct. 8	−83	+57	−28	+3	−44	+1	+81	−15	.....	+28	−31	+13	−31	.....	+19	−98	.....
Oct. 15	−39	−47	−148	−66	+17	+19	+24	−115	.....	+27	−37	+34	−5	.....	−11	−95	.....
Oct. 22	−59	+21	+15	+21	−23	−8	+47	−39	.....	+22	+59	−8	−31	.....	−32	−84	.....
	Accumulated departures on—																
	+182	+7,994	+4,774	+4,956	+5,488	+8,127	+2,541	−1,232	.....	−8,785	+4,242	−3,493	−3,479	.....	−1,659	−7,126	.....

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	h. m.		°	°	°				
Oct. 1	11 7	5582	−77.0	141.6	+11.0	485	.....	.....	U. S. Naval.
		5581	−67.0	151.6	+10.5	.....	388	.....	
		5578	−37.0	181.6	+9.5	.....	2,133	.....	
		5579	−36.0	182.6	−19.0	73	.....	.....	
		5577	−27.0	191.6	−12.0	.....	194	.....	
		5583	−19.0	199.6	−27.5	.....	6	.....	
		5580	+19.0	237.6	−14.0	.....	24	.....	
		5572	+33.5	252.1	+16.5	121	.....	.....	
		5575	+34.0	252.6	+39.0	.....	145	.....	
		5570	+44.0	262.6	+13.5	48	.....	3617	
Oct. 2	11 15	5582	−64.0	141.3	+10.5	388	.....	.....	Do.
		5581	−56.0	149.3	+11.0	.....	533	.....	
		5578	−24.0	181.3	+9.5	.....	2424	.....	
		5579	−22.0	183.3	−19.0	61	.....	.....	
		5577	−12.0	193.3	−12.0	.....	145	.....	
		5584	−8.0	197.3	+25.0	.....	97	.....	
		5583	−7.0	198.3	−27.5	.....	24	.....	
		5585	+43.0	248.3	+11.0	.....	73	.....	
		5572	+46.0	251.3	+16.5	121	.....	.....	
		5575	+49.0	254.3	+39.5	.....	12	.....	
		5570	+59.0	264.3	+13.5	.....	12	3890	
Oct. 4	11 1	5587	−70.0	109.0	+15.0	.....	73	.....	Mt. Wilson.
		5582	−38.0	141.0	+11.0	.....	388	.....	
		5581	−27.0	152.0	+10.0	.....	485	.....	
		5578	+5.0	184.0	+10.0	.....	2424	.....	
		5579	+5.0	184.0	−19.0	.....	.....	61	
		5577	+13.0	192.0	−12.0	.....	97	.....	
		5586	+14.0	193.0	+18.0	.....	36	.....	
		5584	+20.0	199.0	+25.0	.....	97	.....	
		5583	+21.0	200.0	−26.5	.....	12	.....	
		(*)	+22.5	201.5	+17.0	.....	12	.....	
		5585	+70.0	249.0	+10.0	.....	48	.....	
		5572	+72.0	251.0	+17.0	.....	97	3830	Do.
Oct. 5	11 9	5590	−70.0	95.8	+14.0	24	.....	.....	
		5587	−54.0	111.8	+15.0	.....	194	.....	
		5582	−24.0	141.8	+11.0	.....	339	.....	
		5581	−14.0	151.8	+10.0	.....	436	.....	
		5588	+12.0	177.8	−13.0	.....	24	.....	
		5579	+18.0	183.8	−19.0	73	.....	.....	
		5578	+19.0	184.8	+ 9.5	.....	2424	.....	
		5577	+28.0	193.8	−12.0	.....	48	.....	
		5584	+33.0	198.8	+24.0	.....	145	.....	
		5585	+83.0	248.8	+11.0	48	.....	3755	
Oct. 6	11 19	5590	−55.0	97.5	+13.5	24	.....	.....	U. S. Naval.
		5587	−39.0	113.5	+13.0	.....	291	.....	
		(*)	−30.0	122.5	+15.0	.....	24	.....	
		5589	−20.0	132.5	+13.0	.....	24	.....	
		5582	−9.0	143.5	+10.5	.....	339	.....	
		5581	−2.0	150.5	+10.0	.....	388	.....	
		5579	+30.0	182.5	−19.0	61	.....	.....	
		5578	+31.0	183.5	+9.0	.....	2424	.....	
		5584	+49.0	201.5	+23.0	.....	48	3623	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	h. m.		°	°	°				
Oct. 7	13 32	5590	−41.0	97.1	+13.0	.....	73	.....	U. S. Naval.
		5587	−24.0	114.1	+13.0	.....	339	.....	
		5589	−5.0	133.1	+13.0	.....	12	.....	
		5591	−1.0	137.1	−17.0	.....	12	.....	
		5582	+7.0	145.1	+10.0	339	.....	.....	
		5581	+11.0	149.1	+9.0	.....	388	.....	
		5579	+45.0	183.1	−19.5	54	.....	.....	
		5578	+47.0	185.1	+9.0	.....	2327	.....	
		5586	+58.0	196.1	+15.0	.....	36	.....	
		5584	+64.0	202.1	+21.0	36	.....	3616	
Oct. 8	11 5	5590	−28.5	97.7	+12.0	.....	121	.....	Do.
		5587	−11.0	115.2	+13.0	.....	242	.....	
		5591	+9.0	135.2	−17.0	.....	12	.....	
		5582	+19.0	145.2	+10.0	291	.....	.....	
		5581	+25.0	151.2	+9.0	.....	291	.....	
		5592	+31.0	157.2	+15.0	.....	24	.....	
		5579	+58.0	184.2	−19.5	73	.....	.....	
		5578	+58.0	184.2	+9.0	.....	2327	.....	
		5584	+76.0	202.2	+21.5	6	.....	.....	
		5586	+76.0	202.2	+17.0	6	.....	3393	
Oct. 9	10 52	5596	−72.0	41.1	+25.0	48	.....	.....	Mt. Wilson.
		5595	−42.0	71.1	+14.0	.....	97	.....	
		5594	−23.0	90.1	−17.0	.....	16	.....	
		5590	−14.5	98.6	+13.0	.....	145	.....	
		5587	+3.0	116.1	+13.0	.....	194	.....	
		5591	+22.5	135.6	−18.0	.....	24	.....	
		5582	+31.5	144.6	+10.5	.....	267	.....	
		5581	+39.0	152.1	+10.0	.....	291	.....	
		5592	+45.0	158.1	+15.0	.....	97	.....	
		5579	+70.0	183.1	−20.0	73	.....	.....	
		5578	+72.0	185.1	+9.0	.....	2133	.....	
		5586	+73.0	186.1	+17.0	.....	121	3506	
Oct. 10	12 36	5598	−79.0	20.0	−22.0	.....	48	.....	U. S. Naval.
		5596	−63.0	36.0	+24.0	.....	73	.....	
		5595	−28.0	71.0	+12.0	.....	267	.....	
		5594	−10.0	89.0	−18.0	.....	61	.....	
		5590	+0.5	99.5	+12.0	.....	242	.....	
		5587	+18.0	117.0	+14.0	.....	170	.....	
		5591	+37.0	136.0	−18.0	.....	24	.....	
		5582	+47.0	146.0	+10.0	267	.....	.....	
		5581	+54.0	153.0	+10.5	.....	242	.....	
		5592	+62.0	161.0	+14.0	12	.....	.....	
		5578	+85.0	184.0	+9.0	.....	873	.....	
		5586	+88.0	187.0	+16.0	73	.....	2352	
Oct. 11	11 15	5600	−75.0	11.6	−18.5	194	.....	.....	Do.
		5599	−75.0	11.6	+12.0	145	.....	.....	
		5598	−66.0	20.6	−22.5	.....	73	.....	
		5596	−49.5	37.1	+24.0	.....	61	.....	
		5595	−15.0	71.6	+12.0	.....	388	.....	
		5594	+4.0	90.6	−17.5	.....	145	.....	
		5590	+13.0	99.6	+12.0	.....	145	.....	
		5597	+18.0	104.6	+14.0	.....	145	.....	
		5587	+25.0	111.6	+15.0	.....	36	.....	
		5587	+35.0	121.6	+11.0	.....	73	.....	
		5591	+50.0	136.6	−19.0	6	.....	.....	
		5582	+59.0	145.6	+10.0	.....	267	.....	
		5581	+68.0	154.6	+11.0	.....	194	1872	

*=not numbered.

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h. m.*		°	°	°				
Oct. 12	11 31	5599	−61.0	12.2	+12.0		73		U. S. Naval.
		5600	−60.0	13.2	−18.0	145			
		5598	−53.0	20.2	−21.5		170		
		5596	−36.0	37.2	+23.0		73		
		5595	−2.0	71.2	+11.0		485		
		5594	+18.0	91.2	−17.0		291		
		5590	+29.0	102.2	+12.0		97		
		5597	+32.0	105.2	+14.0		194		
		5587	+39.0	112.2	+15.0	24			
		5587	+49.0	122.2	+11.0	36			
		5591	+63.0	136.2	−20.0	6			
		5582	+73.0	146.2	+10.0		267		
		5581	+81.0	154.2	+11.0	97		1958	
Oct. 13	10 50	5600	−47.0	13.4	−16.0		291		Mt. Wilson
		5599	−46.0	14.4	+13.0		73		
		5598	−41.0	19.4	−21.0		388		
		5596	−23.0	37.4	+24.0		73		
		5595	+11.0	71.4	+11.0		630		
		5594	+31.0	91.4	−17.0		776		
		5590	+42.0	102.4	+12.0		73		
		5597	+46.0	106.4	+14.0		194		
		5587	+61.0	121.4	+12.0	24			
		5582	+87.0	147.4	+10.0	242		2764	
Oct. 14	15 7	5600	−32.0	12.8	−17.0		291		U. S. Naval.
		5599	−31.0	13.8	+12.5		73		
		5598	−25.0	19.8	−21.0		242		
		5596	−6.0	38.8	+23.0		61		
		5595	+26.0	70.8	+11.0		485		
		5594	+47.0	91.8	−17.0		679		
		5590	+58.0	102.8	+14.0	24			
		5597	+64.5	109.3	+13.5		121	1,976	
Oct. 15	11 38	5601	−70.0	323.6	−28.0	97			Do.
		5602	−56.0	337.6	−7.0		73		
		5599	−21.0	12.6	+12.0		73		
		5600	−20.5	13.1	−19.0		242		
		5598	−14.0	19.6	−21.0		194		
		5596	+5.0	38.6	+23.0		36		
		5595	+37.0	70.6	+12.0		436		
		5594	+60.0	93.6	−16.5		582		
		5597	+79.0	112.6	+14.0		97	1,830	
Oct. 16	10 55	5601	−60.0	320.8	−27.0		145		Do.
		5602	−43.0	337.8	−6.5		145		
		5599	−9.0	11.8	+12.0	48			
		5600	−8.0	12.8	−19.0		291		
		5598	−1.0	19.8	−21.0		339		
		5595	+50.0	70.8	+12.0		388		
		5594	+74.0	94.8	−16.5		582	1,938	
Oct. 17	9 31	5604	−68.0	300.4	−6.0		97		Mt. Wilson.
		5601	−48.0	320.4	−27.0		121		
		5603	−38.0	330.4	−21.0	24			
		5602	−30.0	338.4	−6.0		170		
		5600	+5.0	13.4	−18.0		242		
		5599	+6.0	14.4	+13.0		48		
		5598	+10.0	18.4	−21.0		388		
		5596	+32.0	40.4	+23.0		12		
		5595	+63.0	71.4	+12.0		242		
		5594	+83.0	91.4	−15.0		97	1,441	
Oct. 18	10 51	5607	−71.0	283.4	−19.0		97		Do.
		5605	−56.0	298.4	+13.0		36		
		5604	−54.0	300.4	−6.0		48		
		5601	−35.0	319.4	−27.0		194		
		5603	−23.0	331.4	−21.0		73		
		5602	−15.0	339.4	−6.0		291		
		5600	+19.0	13.4	−18.0		242		
		5599	+20.0	14.4	+13.0		121		
		5598	+25.0	19.4	−21.0		388		
		5606	+75.0	69.4	+21.0		97		
		5595	+76.0	70.4	+12.0		194	1,781	
Oct. 19	19 25	5608	−65.0	277.0	−15.5		48		Do.
		5607	−58.0	284.0	−19.5		97		
		5605	−43.0	299.0	+13.0	24			
		5604	−41.0	301.0	−6.0	6			
		5601	−22.0	320.0	−27.0	194			
		5603	−10.0	332.0	−21.0		36		
		5602	−0.5	341.5	−6.0		194		
		5600	+31.0	13.0	−18.0		218		
		5599	+31.0	13.0	+13.0		145		
		5598	+38.0	20.0	−21.5		436		
		5596	+59.0	41.0	+23.0		12	1,410	
Oct. 20	11 1	5609	−80.0	248.0	+9.5		48		U. S. Naval.
		5608	−50.5	277.5	−16.0		48		
		5607	−44.0	284.0	−20.5		48		
		5601	−9.5	318.5	−27.0	170			
		5602	+15.0	343.0	−7.0	121			
		5600	+45.0	13.0	−19.5		145		
		5599	+46.0	14.0	+13.0	61			
		5598	+54.0	22.0	−22.0		242	883	
Oct. 21	11 23	5609	−68.0	246.6	+9.5		291		Do.
		5608	−35.0	279.6	−16.0		24		
		5607	−30.0	284.6	−20.0	12			
		5601	+3.0	317.6	−27.0	194			
		5602	+28.0	342.6	−7.0	97			
		5600	+60.0	14.6	−20.0	194			
		5599	+60.0	14.6	+13.0	48			
		5598	+68.0	22.6	−22.0		97	957	
Oct. 22	10 58	5609	−54.5	247.1	+10.0		533		Do.
		5601	+18.0	319.6	−28.0		145		
		5602	+41.0	342.6	−8.0		97		
		5600	+76.0	17.6	−19.5		194	969	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h. m.*		°	°	°				
Oct. 23	11 2	5611	−45.0	243.4	−20.0		24		Mt. Wilson.
		5609	−41.0	247.4	+11.5		776		
		5601	+30.0	318.4	−25.0		170		
		5602	+54.0	342.4	−8.0		97		
		5610	+83.0	11.4	+20.0		145	1,212	
Oct. 24	11 32	5614	−83.0	191.9	+10.0		97		U. S. Naval.
		5609	−26.0	248.9	+11.0		873		
		5612	+8.0	282.9	+18.5		24		
		5601	+43.0	317.9	−26.3		97		
		5602	+69.0	343.9	−8.0		145	1,236	
Oct. 25	11 26	5614	−68.0	193.8	+9.5		194		Do.
		5616	−64.0	197.8	+12.0	24			
		5613	−50.0	211.8	−29.5		291		
		5609	−14.0	247.8	+10.0		873		
		5601	+56.0	317.8	−27.0		85		
		5602	+84.0	345.8	−8.0	97		1,564	
Oct. 26	9 47	5614	−69.0	180.5	+12.0		24		Mt. Wilson.
		5614	−56.0	193.5	+9.5		145		
		5616	−51.0	198.5	+14.0	24			
		5617	−41.0	208.5	−12.0		24		
		5613	−36.0	213.5	−29.0		339		
		5609	−1.0	248.5	+10.5		776		
		5601	+67.0	316.5	−28.0		73	1,405	
Oct. 27	14 9	5618	−80.0	153.9	+12.0	73			Do.
		5614	−54.0	179.9	+13.0		24		
		5614	−49.0	184.9	+7.0		97		
		5614	−39.0	194.9	+9.0		145		
		5617	−41.0	192.9	−11.0		48		
		5616	−35.0	198.9	+14.0		48		
		5613	−21.0	212.9	−28.0		339		
		5609	+16.0	249.9	+12.0		679	1,453	
Oct. 28	11 2	5618	−68.0	154.5	+11.0	73			U. S. Naval.
		5614	−38.0	184.5	+9.0		436		
		5617	−30.0	192.5	−11.0		145		
		5616	−23.0	199.5	+14.0		73		
		5613	−10.0	212.5	−29.0		145		
		5609	+26.0	248.5	+11.0		533	1,405	
Oct. 29	10 53	5620	−69.0	140.3	−11.5	73			Do.
		5618	−55.0	154.3	+12.0	73			
		5621	−31.0	178.3	−11.0		12		
		5614	−24.0	185.3	+8.5		388		
		5617	−17.0	192.3	−10.0		36		
		5616	−10.0	199.3	+14.0		24		
		5613	+3.0	212.3	−29.0		242		
		5609	+41.0	250.3	+10.0		533	1,381	
Oct. 30	11 24	5620	−57.0	138.9	−11.0		121		Do.
		5622	−51.0	144.9	+7.0		145		
		5618	−41.0	154.9	+11.0	73			
		5624	−41.0	154.9	+19.0		48		
		5621	−16.0	179.9	−11.0		97		
		5614	−9.0	186.9	+8.0		291		
		5617	−1.0	194.9	−11.0		24		
		5616	+4.0	199.9	+14.0		24		
		5623	+4.5	200.4	+9.5		61		
		5613	+15.0	210.9	−29.0		218		
		5609	+59.0	254.9	+10.5		388	1,490	

Mean daily area for 29 days = 2,155.

PROVISIONAL SUNSPOT RELATIVE NUMBERS, OCTOBER 1937

[Dependent alone on observations at Zurich and its station at Arosa]

[Furnished through the courtesy of Prof. W. Brunner, Eidgen, Sternwarte, Zurich, Switzerland]

October 1937	Relative numbers	October 1937	Relative numbers	October 1937	Relative numbers
1	131	11	*Eacdd* 148	21	*a* 72
2	*Wc* 170	12	*a* 137	22	58
3	*abd* 214	13	142	23	*Wc* 63
4	*b* 206	14	*Ec* 131	24	*Ecd* 76
5		15	*d* 113	25	69
6	*Eac* 172	16	*a* 127	26	*b* 56
7	*a* ----	17	*ab* 127	27	58
8		18	121	28	*Ec* 104
9	*EEWaccc* 153	19	*a* 114	29	*ad* 90
10	*a* 161	20	*Ec* 89	30	*Ec* 113
				31	*a* 133

Mean, 28 days = 119.6.

a = Passage of an average sized group through the central meridian.
b = Passage of a large group or spot through the central meridian.
c = New formation of a group developing into a middle sized or large center of activity; *E:* on the eastern part of the sun's disc, *W:* on the western part, *M:* in the central circle zone.
d = Entrance of a large or average sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in charge]

By L. P. HARRISON

Mean free-air data based on airplane weather observations during the month of October 1937 are given in tables 1 to 3. A description of the methods by which the various monthly means and normals therein are computed may be found in the aerological section of the MONTHLY WEATHER REVIEW for January and March 1937.

It will be noted that many of the "normals" are based on only 3 years of observation. Conclusions based on departures from such short-period normals must be used with caution.

The mean surface temperatures for October (see chart I) were above normal in the western half of the country and below normal in the eastern half. The positive departures in the west averaged perhaps between 1.5° and 2° C., while the negative departures in the east averaged perhaps 0.5° C., lower in absolute value. The maximum values ranged between +2.2° and +3.9° C., mostly concentrated over the Northwestern States. The maximum departures of opposite sign were neither so pronounced nor so concentrated in the east, the extreme reported being −3.1° C., followed by −2.3° C., with a tendency for fairly well-marked departures to occur near the Great Lakes and southward for a considerable distance.

The mean free-air temperatures for the month up to 5 kilometers were generally below normal by moderate amounts (−1° to −4°C) in the eastern part of the country except over the extreme southern portion at elevations from 4 to 5 kilometers where they were above normal by slight amounts. The free-air temperatures were slightly above normal over the extreme southwest and perhaps the central portion of the Western Plateau. Over the Northwestern States the departures from normal temperature were positive by slight or moderate amounts near the ground up to elevations of 1 to 2.5 kilometers (M. S. L.), but they were negative by similar amounts at higher elevations. The most pronounced departures from normal of the free-air temperatures were those of negative sign over the northeastern sector of the country especially near the Great Lakes where values approximately from −2° to −4°C. prevailed. Elsewhere the departures appeared to be rather inconsequential.

The mean free-air relative humidities and specific humidities are given in table 2. The mean relative humidities for the month over the eastern part of the country were generally close to normal with small positive or negative departures (plus or minus, 1 to 6 percent) near the surface but small, moderate, or large positive departures (+1 to 18 percent) at higher elevations. An exception to this statement must be made with regard to the extreme southern portion of the area in question; where small or moderate negative departures (−1 to −11 percent) occurred above the surface stratum. Generally speaking the greatest positive departures (+11 to +18 percent) occurred over and near the New England coastal area and the eastern Great Lakes in association with the pronounced negative departures of temperature referred to above. Over the north-central portion of the country the humidities were mostly in excess of normal to a slight or moderate extent. The same situation prevailed at elevations from 2 to 5 kilometers over the extreme south-central portion (see Kelly Field, San Antonio, Tex.), while at lower elevations the humidities were deficient to a similar extent. Between the latter two areas the humidities were subnormal to a slight degree. Over the extreme northwest corner of the country the departures of mean humidities from the normal were mostly positive of moderate degree. Elsewhere the deviations from normal appeared to be of no great consequence.

Table 3 shows the monthly mean free-air barometric pressures and equivalent potential temperatures. The lowest mean pressure over continental United States prevailed over the northern Great Lakes and the highest prevailed over the extreme south-central portion of the country. The distribution of pressures was such as to produce cyclonic curvature of the mean monthly isobars about a center near Sault Ste. Marie, Mich., and practically straight east-west isobars over the southern part of the country, except near the ground. A secondary minimum of mean barometric pressure occurred over Salt Lake City, Utah, at 5 kilometers. At the same elevation, the mean pressure over Cheyenne was notably high compared to adjacent stations to east and west (Omaha, 547 millibars; Cheyenne, 551 millibars; Salt Lake City, 546 millibars). As in the normal course, the mean north-south pressure gradients for October increased with respect to those for the preceding month; specifically they increased between 44 and 86 percent at elevations 1 to 5 kilometers along the line from Pensacola to Sault Ste. Marie, Mich. Increases were especially pronounced from Oakland to Sault Ste. Marie, viz, +267 to 100 percent, and from Billings to Sault Ste. Marie, viz, 150 to 200 percent, at elevations 2 to 5 kilometers.

Table 4 shows the free-air resultant winds based on pilot-balloon observations made near 5 a. m. (75th meridian time) during October. Except in the lower kilometer or so above sea level and at higher levels also over certain stations near the Pacific coast, the resultant wind directions for the month were generally close to normal. With approximately the same exceptions plus a considerable proportion of the western plateau from about 3 to 5 kilometers where resultant velocities were deficient in many cases, the resultant velocities were generally in excess of normal by slight to moderate amounts, viz, 1 to 6 m. p. s. The departures exceeding +3 m. p. s. were mostly concentrated over the southeastern part of the country. The negative departures were mostly slight except over Cheyenne at 5 kilometers, viz, −4.3 m. p. s.

In the lower kilometer stratum above sea level excluding the surface from consideration, stations in the north-central portion of the country exhibited monthly resultants which were oriented clockwise from normal by amounts ranging approximately from 30° to 90°. Orientations of similar amount, but counterclockwise in rotation, occurred in the resultants at several stations in the southeast. At 1 kilometer over Houston, Tex., the orientation from normal was about 170° (normal direction from N. 146°). Thus in the stratum near the ground, northwest or west-northwest resultant directions were the rule rather than the southwest to west directions over the north-central portion of the country and the northeasterly directions over the southeastern portion respectively which normally prevail, although the resultant velocities were generally subnormal by small amounts in these cases (viz, 0.5 to 2 m. p. s.) over the former area but supernormal by similar amounts over the latter.

With regard to stations near the west coast, the Medford, Oreg., monthly resultants were oriented from 40° to 70° counterclockwise from normal direction between 2 and 3 kilometers, i. e., more from the south than the

usual southwest or west. The Oakland, Calif., resultants from 2.5 to 3 kilometers were similarly oriented with respect to the normals (viz, 60° and 20°), in this case representing orientations more from the west than the customary NNW. and NW.

Table 5 shows the maximum free-air wind velocities and their directions for various sections of the United States during October as determined by pilot balloon observations. The extreme maximum was 51.6 m.p.s. from the SW. at 8,600 meters above sea level over Modena, Utah.

The mean monthly specific humidities and equivalent potential temperatures are shown in tables 2 and 3, respectively. The minima of both elements occurred in the vicinity of Sault Ste. Marie, Mich., while the maxima occurred near the extreme south-central part of the country or slightly to the west thereof. The distribution of the mean data under consideration gave lines of equal value whose configurations were similar in their major features to those of the mean monthly isobars previously discussed. From 1.5 to 4 kilometers there was evidence, however, of some anticyclonic curl of the lines in question over the southern half of the western plateau. This contrasted with the cyclonic curl over the north, especially, northeastern part of the country.

During October the western half of the country was mostly under the dominance of anticyclones of Pp origin which crossed the west coast from the Pacific. Temperatures in the lower strata over the area under consideration were warmer than usual, partly as a result of subsidence and dryness within the Pp air masses over the western plateau, intensity of the received insolation through the relatively clear air, the presumably warm character of these masses of air compared to the normal possibly due to the unusual southwestward displacement of the North Pacific high pressure area, and perhaps also the thermodynamic effects of frequent blocking of warm, moist air from the Gulf of Mexico by the anticyclonic circulation over the plateau. Precipitation was therefore rather scattered in the West and considerably deficient over extensive areas, particularly in the Dakotas, Minnesota, southern California, Arizona, and the Texas Panhandle where only one-fourth of the normal or less was observed. On the other hand, precipitation was superabundant in a few small areas, viz, eastern Montana, western North Dakota, northern California, and southern New Mexico, where 150 percent of the normal amounts occurred. The rainfall here was generally associated with occluded front passages.

The eastern part of the country was frequently subject to the effects of outbursts of Pc air masses from the vicinity of central Canada southward and southeastward along or across the Mississippi Valley, thence eastward and northeastward out into the Atlantic Ocean. These outbursts of cold air produced abnormally cold weather from the Great Lakes southward for some distance and frequent alternations over the east of anticyclones with Pp or Pc air masses at the lower elevations, the former more commonly on the western portions and the latter on the eastern portions of the anticyclonic circulations. Important in this connection were the relatively strong pressure gradients which existed from the vicinity of Montana to northern Michigan, owing to the respective temperature and pressure distributions in the dominating air masses.

As the alternating anticyclones from the west, northwest, or north progressed so that their western flanks were in the vicinity of the Mississippi Valley, relatively warm, moist air from the Gulf of Mexico was able to move northward up the valley. When the movement of this air had prevailed for a sufficient time, ascent of the humid air up the flanks of the eastward moving anticyclones was productive of copious precipitation from Louisiana to the Great Lakes and eastward to the Atlantic. In fact, from two to three times the normal amounts fell in a narrow belt extending from the extreme lower Mississippi Valley to southeastern Pennsylvania and eastern Maryland. This precipitation was largely in association with cyclones which developed along the advancing fronts of the cold air masses or increased in intensity near the lower Mississippi Valley and moved east and northeastward.

TABLE 1.—*Mean free-air temperatures (t), °C obtained by airplanes during October 1937.* (*Dep. represents departure from "normal" temperature*)

Station	Number of obs.	Altitude (meters) m. s. l.																	
		Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
		t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.
Barksdale Field [1] (Shreveport), La. (52 m)	26	13.2	−1.1	15.5	−1.6	13.7	−1.4	12.6	−0.8	10.4	−0.8	7.5	−1.2	4.9	−1.4	1.1	−0.2		
Billings, Mont.[3] (1,090 m)	31	8.4	+1.2					10.4	+0.6	8.4	+0.4	5.3	+0.1	1.8	−0.2	−5.5	−0.7	−13.1	−1.6
Boston, Mass.[3] (5 m)	27	9.0	−0.6	8.6	+0.1	6.1	−0.3	4.0	−0.8	1.8	−1.4	0.2	−1.1	−2.1	−1.3	−6.9	−1.0	−13.5	−1.4
Cheyenne, Wyo.[3] (1,873 m)	30	5.7	+1.1							7.3	+0.8	7.9	+0.7	4.6	+0.4	−2.7	+0.2	−9.7	+0.3
Chicago, Ill.[3] (187 m)	30	7.8	−1.0	7.9	−1.5	6.1	−2.0	4.1	−2.0	1.7	−2.4	−0.6	−2.3	−2.9	−2.0	−8.0	−1.8	−13.2	−1.3
Coco Solo, Canal Zone [2] (15 m)	26	24.6		23.9		21.0		18.4		15.7		13.2		10.4		4.3		−1.5	
El Paso, Tex.[3] (1,194 m)	31	14.1	+0.3					17.3	+0.4	14.7	−0.4	11.5	−0.8	7.7	−1.2	0.9	−0.9	−4.9	−0.7
Fargo, N. Dak.[3] (274 m)	31	3.5	−0.3	5.6	−0.7	3.8	−2.0	2.4	−1.8	1.0	−1.4	−1.1	−1.1	−3.6	−1.2	−8.8	−1.1	−14.7	−1.0
Kelly Field (San Antonio), Tex.[1] (206 m)	31	17.3	+0.5	19.3	−0.1	18.3	−0.5	16.1	−0.1	13.5	−0.6	11.1	−0.6	8.7	−0.3	3.0	−0.2	−3.0	+0.3
Lakehurst, N. J.[3] (39 m)	24	6.2	−2.2	8.1	−1.4	4.9	−2.4	2.5	−3.2	0.5	−3.4	−1.5	−3.3	−4.2	−3.7	−9.7	−4.1		
Maxwell Field (Montgomery), Ala.[1] (52 m)	16	16.7	+0.7	16.5	−1.6	14.0	−1.8	11.2	−2.1	9.2	−2.2	8.0	−1.5	5.9	−1.3	1.0	−0.3	−4.3	+0.5
Mitchel Field (Hempstead, L. I.), N. Y.[1] (29 m)	21	8.9	−0.1	8.7	−0.4	6.1	−0.9	3.8	−1.6	2.3	−1.4	0.3	−1.3	−2.3	−1.7	−6.7	−1.4		
Nashville, Tenn.[2] (180 m)	30	12.0	0.0	12.6	−1.7	10.7	−1.9	8.5	−2.0	6.4	−1.9	4.3	−2.0	1.7	−2.1	−3.5	−1.7	−8.7	−1.1
Norfolk, Va.[3] (10 m)	20	11.9	−2.1	12.5	−1.1	9.3	−1.7	7.5	−1.7	5.9	−1.5	3.6	−1.7	1.3	−1.8	−2.9	−1.1	−8.1	−0.6
Oakland, Calif.[3] (2 m)	31	13.6		16.4		16.1		14.1		11.6		8.4		5.6		−0.4		−6.1	
Oklahoma City, Okla.[3] (391 m)	31	12.1	−0.7	15.0	+0.2	14.8	−0.8	13.1	−0.9	10.8	−1.1	7.8	−1.3	4.8	−1.2	−0.6	−0.4	−6.7	−0.4
Omaha, Nebr.[3] (300 m)	31	8.2	−0.2	10.4	+0.4	9.9	−1.0	8.3	−1.1	5.8	−1.7	3.1	−2.0	0.6	−1.8	−4.6	−1.0	−10.6	−0.6
Pearl Harbor, Territory of Hawaii [3] (6 m)	31	22.6	−2.1	22.0	−0.2	18.6	+0.2	16.1	+0.6	14.1	+1.0	12.8	+1.2	10.8	+1.1	6.2	+2.3	0.2	+2.5
Pensacola, Fla.[3] (13 m)	22	15.8	−1.7	17.8	−0.2	15.6	−0.3	13.2	−0.5	11.2	−0.5	8.9	−0.6	6.8	−0.3	2.6	+0.8	−2.7	+1.9
St. Thomas, Virgin Islands [2] (8 m)	29	28.6		24.6		21.0		18.2		15.7		13.5		11.1		6.0		0.4	
Salt Lake City, Utah [2] (1,288 m)	31	9.6						12.6		10.6		7.3		4.0		−2.3		−8.4	
San Diego, Calif.[3] (10 m)	30	15.5	−1.9	17.1	−0.2	19.2	+1.4	17.1	+1.1	15.0	+1.2	12.6	+1.5	9.4	+1.2	3.3	+1.1	−2.7	+1.7
Sault Ste. Marie, Mich.[3] (221 m)	29	5.0		3.7		0.4		−1.6		−2.8		−4.8		−7.1		−12.4		−18.2	
Scott Field (Belleville), Ill.[1] (135 m)	24	7.0	−1.5	11.2	−1.6	9.3	−2.3	6.7	−2.7	4.5	−2.8	2.0	−3.4	−0.2	−3.1	−5.2	−2.6	−11.0	−2.6
Seattle, Wash.[3] (10 m)	9	14.2		14.3		14.4		13.0		10.6		8.0		5.9		0.3		−6.2	
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	25	6.0	−1.0	6.1	−2.6	3.6	−3.2	1.1	−3.8	−1.0	−3.9	−2.8	−3.7	−5.5	−3.9	−10.7	−3.5	−17.2	−3.7
Spokane, Wash.[3] (597 m)	31	7.8	+1.2			10.2	+0.5	8.3	−0.3	5.1	−1.1	2.0	−1.5	−0.9	−1.6	−7.2	−1.7	−14.4	−2.2
Washington, D. C.[3] (13 m)	26	10.1	−1.4	10.1	−1.4	8.2	−1.6	5.6	−2.2	3.6	−2.3	1.7	−2.3	−0.7	−2.6	−5.7	−3.1	−11.3	−3.0
Wright Field (Dayton), Ohio [1] (244 m)	25	6.4	−1.2	8.2	−2.0	6.2	−3.0	4.3	−3.0	2.1	−3.1	−0.2	−3.2	−2.4	−3.3	−6.8	−2.7	−12.6	−2.1

[1] Army. [2] Weather Bureau. [3] Navy.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month (years of record are given in parentheses following the number of observations): Barksdale Field, 80 (3); Billings, 122 (4); Boston, 123 (5); Cheyenne, 123 (4); Chicago, 89 (3); El Paso, 92 (3); Fargo 123, (4); Kelly Field, 111 (4); Lakehurst, 108 (4); Maxwell Field, 100 (4); Mitchel Field, 92 (4); Nashville, 123 (4); Norfolk, 178 (8); Oklahoma City, 123 (4); Omaha, 217 (7); Pearl Harbor, 164 (6); Pensacola, 218 (9); San Diego, 227 (9); Scott Field, 88 (4); Selfridge Field, 118 (4); Spokane, 122 (4); Washington, 222 (10); Wright Field, 109 (4).

TABLE 2.—*Mean free-air relative humidities (R. H.), in percent, and specific humidities (q), in grams/kilogram, obtained by airplanes during October 1937.* (*Dep. represents departure from "normal" relative humidity*)

Station	Altitude (meters) m. s. l.																											
	Surface				500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of observations	q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.	
			Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.
Barksdale Field, La	26	7.8	84	0	6.7	58	−4	6.1	56	−5	5.2	48	−9	4.4	44	−10	3.6	42	−6	3.2	42	−4	2.0	31	−8			
Billings, Mont	31	5.0	64	+1							4.9	52	0	4.4	51	+2	3.7	49	0	2.9	48	0	1.9	48	0	1.3	51	+2
Boston, Mass	27	5.6	79	+4	5.6	77	+8	4.7	72	+7	4.3	71	+10	3.9	71	+14	3.3	65	+12	3.1	65	+14	2.5	66	+18	1.7	63	+15
Cheyenne, Wyo	30	4.6	66	+3										4.9	62	+2	4.5	52	+1	3.9	52	+4	2.6	51	+4	1.7	49	+3
Chicago, Ill	30	5.3	79	−1	5.3	76	+3	4.6	69	+2	3.9	63	+2	3.6	64	+5	3.0	62	+6	2.7	61	+6	2.0	57	+6	1.4	53	+9
Coco Solo, Canal Zone	26	18.5	96		16.8	86		15.3	88		13.5	86		11.8	84		10.0	80		8.5	78		6.5	80		4.9	77	
El Paso, Tex	31	7.1	62	+1							6.5	44	−2	5.7	43	−2	5.0	44	0	4.3	47	+2	3.1	48	0	2.0	39	+5
Fargo, N. Dak	31	3.6	72	−1	4.2	70	+3	3.9	69	+8	3.6	67	+10	3.1	60	+8	2.8	58	+7	2.4	58	+10	1.7	53	+5	1.2	51	+5
Kelly Field, Tex	31	9.6	77	−11	9.5	65	−9	8.0	55	−8	7.4	55	−6	6.5	54	+2	5.2	48	+4	4.4	45	+4	3.0	40	+6	2.0	37	+8
Lakehurst, N. J	24	5.3	90	+4	4.7	68	−2	4.2	69	0	3.7	69	+5	3.1	62	+5	2.7	56	+4	2.4	57	+8	1.4	46	+1			
Maxwell Field, Ala	16	9.0	76	−6	7.9	64	+2	7.5	67	+5	6.3	65	+5	4.9	54	+3	3.2	37	−3	2.6	32	−3	2.4	37	+3	1.4	29	−1
Mitchel Field, N. Y	21	5.8	83	−3	5.7	77	+2	5.0	77	+5	4.6	77	+9	4.0	69	+9	3.5	65	+8	2.9	63	+8	1.8	49	+1			
Nashville, Tenn	30	6.8	77	−6	6.2	66	0	5.6	63	+1	4.6	57	−1	4.2	56	+2	3.7	53	+5	3.2	53	+5	2.2	46	+3	1.4	42	+3
Norfolk, Va	20	6.7	78	+1	6.0	64	−2	5.2	65	+1	4.9	65	+8	4.3	58	+7	3.6	54	+8	3.0	51	+10	2.4	49	+13	1.9	48	+15
Oakland, Calif	29	8.1	85		8.1	66		6.4	50		4.8	41		3.8	36		3.1	34		2.4	31		2.0	33		1.5	34	
Oklahoma City, Okla	31	6.6	73	−8	7.0	62	−10	6.3	54	−6	5.6	51	−5	5.0	50	−3	4.3	49	−1	3.6	47	0	2.3	41	−3	1.5	36	−2
Omaha, Nebr	31	5.4	77	−3	5.4	65	−5	4.9	58	+1	4.4	55	+2	3.9	53	+4	3.6	56	+9	3.1	55	+8	2.2	51	+7	1.5	49	+6
Pearl Harbor, Territory of Hawaii	31	14.8	87	+9	13.5	78	+1	12.5	84	+4	10.7	79	+4	8.2	66	−2	6.2	50	−4	4.7	41	−1	2.7	28	−4	1.6	23	−5
Pensacola, Fla	22	9.7	88	+6	9.4	71	−1	8.4	69	+1	6.9	62	−1	5.3	53	−2	4.5	47	−3	3.6	40	−5	2.2	28	−10	1.3	23	−11
St. Thomas, Virgin Islands	29	16.6	68		16.8	83		14.7	85		11.7	76		10.3	74		8.4	65		6.4	56		3.5	40		2.5	37	
Salt Lake City, Utah	31	5.6	65								5.6	53		5.0	50		4.4	52		3.8	53		2.8	55		1.9	52	
San Diego, Calif	30	9.4	86	+11	9.4	73	+5	7.3	47	−2	5.6	39	−3	4.2	31	−4	3.4	28	−4	2.9	27	−3	2.2	28	+1	1.2	23	0
Sault Ste. Marie, Mich	29	4.3	78		4.0	77		3.7	83		3.1	75		2.5	62		2.2	60		2.0	58		1.2	49		0.7	42	
Scott Field, Ill	24	5.0	80	−6	4.8	55	−4	4.4	54	−2	4.0	54	+2	3.2	49	+1	2.9	50	+5	2.5	47	+3	1.9	43	+1	1.3	46	+6
Seattle, Wash	9	8.0	81		7.8	74		7.4	65		6.3	57		5.0	52		4.4	50		3.9	47		2.6	42		1.7	40	
Selfridge Field, Mich	25	4.7	80	−2	4.5	73	+3	4.0	71	+4	3.6	72	+10	3.0	66	+11	2.6	61	+12	2.2	60	+13	1.6	55	+11	1.1	61	+18
Spokane, Wash	31	5.9	86	+4				5.8	68	+3	5.4	68	+8	4.8	70	+11	4.1	69	+11	3.2	63	+8	2.2	62	+10	1.4	59	+9
Washington, D. C	26	6.1	80	+3	5.2	65	+1	4.7	62	+2	4.2	64	+7	3.7	61	+7	3.0	54	+6	2.6	52	+8	1.8	46	+12	1.1	40	+12
Wright Field, Ohio	25	4.9	80	−6	5.0	71	−1	4.5	68	+4	3.9	63	+5	3.6	63	+10	3.1	62	+12	2.6	56	+11	2.0	52	+11	1.2	46	+6

TABLE 3.—*Mean free-air barometric pressures (P), in mb, and equivalent potential temperatures (Θ_e), in °A, obtained by airplanes during October 1937*

Stations	Altitude (meters) m. s. l.																											
	Surface			500		1,000		1,500		2,000		2,500		3,000		4,000		5,000											
	Number of observations	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e	P	Θ_e										
Barksdale Field, La	26	1,011	307	958	311	903	313	851	315	802	316	754	316	710	317	627	320												
Billings, Mont	31	892	305					849	312	799	314	752	314	707	313	623	313	548	313										
Boston, Mass	27	1,016	296	957	301	901	301	847	303	797	305	748	307	703	310	618	314	545	315										
Cheyenne, Wyo	30	813	309							801	314	753	319	709	319	625	318	551	318										
Chicago, Ill	30	995	296	957	299	901	301	848	302	797	304	748	305	703	307	618	311	544	315										
Coco Solo, Canal Zone	26	1,009	349	955	349	902	347	851	345	803	342	756	341	713	339	630	338	558	337										
El Paso, Tex	31	883	318					851	324	803	324	756	324	711	323	629	323	555	324										
Fargo, N. Dak	31	983	287	956	294	899	297	845	300	794	302	746	304	700	306	616	309	541	312										
Kelly Field, Tex	31	993	318	960	323	905	323	853	324	805	325	757	324	713	324	631	325	558	326										
Lakehurst, N. J	24	1,014	292	959	298	902	299	848	300	797	301	748	303	703	305	618	307												
Maxwell Field, Ala	16	1,012	314	960	315	905	317	853	316	802	315	755	315	710	316	628	321	555	322										
Mitchel Field, N. Y	21	1,014	297	958	301	901	302	847	304	797	306	748	308	703	308	619	312												
Nashville, Tenn	30	996	304	959	307	903	308	850	309	800	310	752	313	707	314	624	316	549	319										
Norfolk, Va	20	1,018	302	960	306	904	305	850	308	801	310	752	311	707	312	623	317	549	321										
Oakland, Calif	[1] 31	1,016	307	958	316	904	316	852	315	802	315	755	315	710	315	627	318	554	322										
Oklahoma City, Okla	31	971	306	959	311	904	314	851	316	802	317	755	318	710	318	627	319	553	321										
Omaha, Nebr	31	981	298	958	303	902	306	849	308	799	309	751	311	706	312	622	315	547	317										
Pearl Harbor, Territory of Hawaii	31	1,014	336	959	337	905	336	854	334	805	330	758	329	714	328	634	328	560	328										
Pensacola, Fla	22	1,016	314	960	321	905	321	853	320	804	319	755	319	711	320	629	323	555	325										
St. Thomas, Virgin Islands	29	1,014	348	959	349	905	345	854	339	806	338	759	336	715	333	634	329	561	331										
Salt Lake City, Utah	31	874	310					852	316	802	317	754	317	710	317	626	319	546	322										
San Diego, Calif	30	1,013	313	957	320	903	323	851	321	802	320	756	320	711	321	630	323	556	324										
Sault Ste. Marie, Mich	29	988	291	955	292	898	293	843	294	791	297	742	299	696	302	611	304	536	307										
Scott Field, Ill	24	1,002	294	959	301	903	304	849	305	799	306	750	308	706	310	622	314	548	316										
Seattle, Wash	9	1,019	307	960	312	905	317	852	318	803	318	757	318	712	320	630	321	556	322										
Selfridge Field, Mich	25	993	292	956	296	898	296	844	298	793	300	744	302	699	304	614	307	539	310										
Spokane, Wash	31	947	302			903	308	850	311	800	311	751	311	706	311	622	312	547	313										
Washington, D. C	26	1,018	298	960	301	904	303	850	304	800	306	752	307	706	309	622	312	548	315										
Wright Field, Ohio	25	988	294	957	299	901	300	847	302	797	304	748	306	703	308	619	312	544	315										

[1] 31 observations for P; however 29 for Θ_e in this case.

TABLE 4.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during October 1937*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (283 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Nashville, Tenn. (194 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	11	1.5	335	1.0	268	3.0	241	1.8	276	4.1	278	1.3	279	0.1	258	2.0	294	0.8	27	1.2	78	1.8	128	0.5	257	0.9
500	----	----	323	2.1	----	----	264	5.1	----	----	310	5.0	246	2.1	281	4.1	311	3.5	132	1.5	89	3.9	93	0.1	241	2.1
1,000	----	----	316	3.8	----	----	261	5.3	----	----	306	5.6	275	4.0	291	6.9	302	4.7	313	1.6	113	3.0	150	0.9	277	3.8
1,500	----	----	306	5.0	266	6.6	262	7.4	----	----	293	7.0	267	5.8	284	8.0	302	7.2	334	4.4	134	2.3	172	3.4	284	5.0
2,000	251	1.0	291	6.0	282	6.5	264	8.2	279	6.3	293	8.1	273	6.8	289	8.8	309	10.0	326	5.2	119	2.5	179	4.1	294	6.9
2,500	275	3.4	284	6.7	288	7.5	254	10.0	290	7.4	294	10.5	265	7.2	294	9.6	313	9.5	331	6.1	130	1.6	197	4.3	297	8.4
3,000	286	4.8	280	7.4	296	8.4	271	11.5	297	7.3	284	14.0	250	6.7	297	11.2	313	12.5	332	6.7	83	1.3	197	2.9	284	8.8
4,000	278	6.9	301	10.2	308	8.1	----	----	298	7.9	----	----	----	----	----	----	----	----	299	5.1	34	1.4	290	2.4	----	----
5,000	310	6.8	----	----	----	----	----	----	276	3.7	----	----	----	----	----	----	----	----	280	4.7	----	----	----	----	----	----

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Hawaii [1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	304	1.3	150	0.7	160	0.9	2	0.5	----	----	41	3.5	290	1.1	145	2.3	40	0.9	338	1.4	133	1.6	125	0.6	307	1.2
500	275	4.1	347	0.4	189	2.0	318	1.2	----	----	353	2.1	305	3.0	----	----	345	2.8	303	2.3	194	3.5	----	----	279	3.6
1,000	270	6.3	37	0.7	226	2.3	299	3.7	----	----	312	3.6	302	4.4	----	----	321	2.4	300	5.1	188	3.6	201	2.3	278	4.9
1,500	273	7.2	160	0.6	277	4.4	295	6.3	----	----	300	4.2	295	6.9	166	3.0	294	2.1	299	7.3	206	5.0	246	4.1	278	6.9
2,000	265	7.5	45	0.4	302	6.0	301	8.3	----	----	298	5.7	297	8.0	185	2.2	271	2.6	281	9.3	206	4.2	240	4.2	274	9.2
2,500	255	8.3	280	1.4	315	6.6	306	9.3	----	----	299	7.0	298	8.8	232	1.9	260	3.5	282	8.5	236	5.8	256	5.1	275	11.3
3,000	----	----	288	3.5	307	7.1	305	9.9	----	----	316	6.7	302	8.1	258	2.7	249	5.3	----	----	235	6.7	252	6.6	263	8.8
4,000	----	----	----	----	266	3.3	296	10.4	----	----	----	----	275	7.3	288	4.0	286	6.1	----	----	----	----	267	5.8	----	----
5,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	272	5.9	301	8.0	----	----	----	----	----	----	----	----

[1] Navy stations.

TABLE 5.—*Maximum free air wind velocities meters per second, for different sections of the United States based on pilot balloon observations during October 1937*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station
Northeast [1]	35.8	WNW	2,410	30	Kylertown	44.8	WNW	3,550	30	Buffalo	29.4	WNW	6,040	9	Boston.
East-Central [2]	37.8	WSW	1,150	20	Cincinnati	39.0	SW	4,420	19	Nashville	40.0	SW	5,220	20	Greensboro.
Southeast [3]	29.9	WSW	2,500	20	Charleston	33.6	WNW	3,360	24	Atlanta	41.0	W	8,420	29	Tampa.
North-Central [4]	32.5	WSW	1,370	19	Detroit	34.0	WNW	3,170	30	Detroit	37.9	NW	9,730	14	Fargo.
Central [5]	33.2	SW	1,040	5	Wichita	42.2	NNW	4,660	26	Wichita	39.0	WSW	7,060	5	Omaha.
South-Central [6]	29.8	N	1,330	18	Amarillo	45.2	NW	4,630	19	Fort Worth	50.0	NW	6,390	19	Abilene.
Northwest [7]	38.6	SSW	1,550	27	Portland	36.5	WSW	2,850	28	Spokane	37.1	NNE	11,810	7	Portland.
West-Central [8]	23.2	SSW	2,480	14	Modena	40.7	NNW	4,920	19	Rock Springs	51.6	SW	8,600	6	Modena.
Southwest [9]	25.4	WNW	1,380	20	Havre	40.4	NW	4,890	18	El Paso	48.0	NW	5,420	18	Albuquerque.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and Western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, Northern Nevada, and Northern California.
[9] Southern California, Southern Nevada, Arizona, New Mexico, and extreme West Texas.

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in Charge]

By BENNETT SWENSON

During October 1937, a month which is normally quite dry, an unusual number of floods occurred in eastern United States. The precipitation during the month was above normal quite generally east of the Mississippi River, except in the upper Lake region and in the extreme Southeast. A narrow band over which from two to three times the normal precipitation occurred extended from southeastern Pennsylvania and eastern Maryland southwestward to the mouth of the Mississippi River. Because of low river stages and the dry condition of the ground prior to the rains, the floods were generally not severe.

Atlantic Slope drainage.—Light floods occurred in the

Schuylkill and Chenango Rivers from the 23d to 25th as the result of frequent rains during the month followed by generally heavy rains over the watersheds on the 22d and 23d. No damage of consequence was reported.

Precipitation over the Potomac Basin for October was considerably above normal and amounts varied from 6 to 11 inches over the entire basin. Moderately heavy rains occurred on the 19th and 20th and again on the 23d over portions of the basin but the immediate cause of the flood in the Potomac River was the excessive precipitation on the 27th and 28th. The heaviest rains in the latter period occurred principally over the upper portion of the North Branch of the Potomac and over Stony River. The amounts averaged about 4.5 inches over the North Branch above Keyser, W. Va., and from 3 to 4 inches over other portions of the upper Potomac Basin, with lesser amounts over the lower portion of the basin.

The flood was distinctly an "up river" flood, with a sharp crest at Cumberland and below that point there was a decided flattening of the crest. This was expected, since the stages in the Shenandoah River were relatively low and while other tributaries below Hancock, Md., had moderate amounts of water, the maximum water from these streams had reached the Potomac and passed downstream before the crest from upstream had reached that portion of the river.

The crest at Cumberland (25.0 feet) exceeded the highest stage reached there in April 1937 (24.2 feet) but the crest at Washington, D. C., was only 7.7 feet in this flood as compared to 14.2 feet in April 1937. The low stage registered at Washington was further aided by a strong northwest wind and the arrival of the crest at the time of low tide.

No estimate of the amount of damage has been made at this time.

Heavy rains on the 18th to 20th and again on the 27th and 28th over the James River Basin resulted in two floods in the lower James River. The crests were 30.9 feet on the 20th and 21.5 feet on 29th at Columbia, Va., and 18.6 feet on 21st and 22d and 10.3 feet on the 30th at Richmond, Va. No losses of consequence were incurred.

South of the James River Basin moderately heavy floods occurred principally in the Roanoke River in Virginia and North Carolina, the Saluda River in South Carolina, and the Savannah River in South Carolina. Damages in the Roanoke Basin are estimated at $110,000, which does not include considerable damage to matured corn in the upper tributaries from which definite estimates have not been received. Losses amounting to about $37,000 were reported from the Saluda River Basin, the greater part of which occurred along Reedy River, a tributary of the Saluda in Greenville County.

Ohio Basin.—Heavy rains on the 27th to 29th over the extreme eastern portion of the Ohio Basin resulted in a moderate flood in the Monongahela watershed, resulting in a crest stage of 27.8 feet (2.8 feet above flood stage) on the Ohio at Pittsburgh, Pa. These same rains produced floods, mostly light, in the Little Kanawha and Elk Rivers in West Virginia and in the North Fork of the Holston at Mendota, Va.

Another period of heavy rain over portions of the basin from the 17th to 19th caused light floods in the New River in Virginia, French Broad River in North Carolina, and the West Fork of the White River in Indiana.

No losses of consequence were reported in the Ohio Basin with the exception of damage to crops in Henderson County in North Carolina, amounting to about $3,500. Statistics on the flood in the Monongahela River are not available at this time but a report will be made in a later issue of the REVIEW.

Table of Flood Stages During October 1937

[All dates in October unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
	Feet			*Feet*	
Schuylkill: Reading, Pa	10	24	25	11.8	24
Tioughnioga: Whitney Point, N. Y	12	23	25	15.1	24
Chenango: Sherburne, N. Y	8	23	24	8.9	23
North Branch of Potomac: Cumberland, Md.	17	28	29	[1] 25.0	28
Potomac:					
Hancock, Md	32			31.8	29
Harpers Ferry, W. Va	18	29	30	21.5	29
Sycamore Island, Md	10	29	31	15.4	30
Washington, D. C	8			7.7	30
James:					
Columbia, Va	10	4	6	12.9	5
		19	25	30.9	20
		27	31	21.5	29
Richmond, Va	8	20	23	18.6	21–22
		29	30	10.3	30
Dan:					
Danville, Va	11	5	6	11.7	6
		20	21	19.0	21
Clarksville, Va	13	21	23	16.5	22
Roanoke:					
Randolph, Va	21	20	23	29.2	21
Weldon, N. C	31	6	9	35.7	8
		21	26	45.0	24
		29	30	34.3	30
Williamston, N. C	10	11	17	11.0	15
		24	[2]	12.9	29
Saluda:					
Pelzer, S. C	6	18	23	14.0	19
Chappells, S. C	15	4	5	17.5	5
		20	23	20.9	22
Broad: Blairs, S. C	14	20	22	21.2	21
Catawba:					
Catawba, N. C	8	19	21	20.1	20
Catawba, S. C	11	21	21	12.5	21
Santee:					
Rimini, S. C	12	1	2	12.5	1
		6	16	13.7	10
		22	[2]	14.0	25, 27
Ferguson, S. C	12	8	17	12.8	11
		23	[2]	13.6	27
Broad: Carlton, Ga	15	4	4	15.0	4
		19	20	24.0	19
Savannah:					
Calhoun Falls, S. C	8	20	20	8.2	20
Clyo, Ga	13	28	[2]	15.3	30
MISSISSIPPI SYSTEM					
Ohio Basin					
Tygart:					
Elkins, W. Va	15	28	29	17.0	29
Philippi, W. Va	20	28	30	26.7	29
Youghiogheny: Connellsville, Pa	13	28	29	14.4	28
Monongahela:					
Lock No. 15, Hoult, W. Va	22	28	29	32.7	28
Lock No. 7, Greensboro, Pa	30	28	30	39.2	29
Lock No. 4, Charlerol, Pa	30	28	30	35.9	29
Little Kanawha:					
Glenville, W. Va	23	28	29	28.3	29
Creston, W. Va	20	28	29	20.7	28
New: Glenlyn, Va	11	20	30	12.9	20
Elk: Clay, W. Va	18	28	29	24.6	28
West Fork of White:					
Anderson, Ind	8	18	25	10.0	20
Elliston, Ind	18	20	20	19.2	20
Edwardsport, Ind	12	20	24	15.3	22
North Fork of Holston: Mendota, Va	8	28	28	9.3	28
French Broad: Asheville, N. C	6	19	21	7.2	20
Ohio: Pittsburgh, Pa	25	29	30	27.8	29

[1] Reading furnished by U. S. Geological Survey.
[2] Continued into November.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in charge]

NORTH ATLANTIC OCEAN, OCTOBER 1937

By H. C. HUNTER

Atmospheric pressure.—The pressure averaged above normal over the northeastern North Atlantic, also over the waters adjacent to Newfoundland and eastern Canada. There was a very small excess around the Azores. On the other hand, near southern Greenland there was a considerable deficiency; the same condition appears over waters adjacent to the Iberian Peninsula and northwestern Africa, owing chiefly to almost continuously low pressure near the southwestern coast of Europe during the final 12 days of the month. The southwestern part of the North Atlantic similarly had pressure somewhat below normal practically all the latter part of the month, and for the entire month averaged slightly below normal, as did the Gulf of Mexico.

The extremes of pressure among vessel reports at hand are 30.68 and 28.40 inches. The higher mark was noted on the American steamship *Solana*, quite near the New Jersey coast, during the forenoon of the 17th; while the lower reading was reported by the German liner *New York*, in the English Channel about noon of the 23d.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, October 1937*

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.63	−0.11	30.20	24	29.14	4
Reykjavik, Iceland	29.71	+.03	30.51	10	28.85	17
Lerwick, Shetland Islands	29.90	+.11	30.59	4	28.79	24
Valencia, Ireland	29.97	+.06	30.56	4	28.91	25
Lisbon, Portugal	29.95	−.07	30.21	17	29.21	26
Madeira	29.93	−.06	30.18	3	29.62	26
Horta, Azores	30.13	+.02	30.33	1, 23	29.82	25
Belle Isle, Newfoundland	29.92	+.06	30.42	23	28.92	31
Halifax, Nova Scotia	30.06	+.02	30.56	17	29.28	30
Nantucket	30.04	−.01	30.62	17	29.40	29
Hatteras	30.05	−.01	30.52	16	29.45	23
Bermuda	30.05	−.02	30.24	17	29.78	28
Turks Island	29.93	−.02	30.00	16, 17	29.80	26
Key West	29.94	.00	30.05	5	29.76	23
New Orleans	30.00	−.03	30.24	15	29.75	2

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—A moderate number of wind reports of forces 10 or 11 have been received and a single report of force 12. From the 4th to 9th and from the 13th to 17th there was not much storminess, as far as information is available; while after the 20th conditions were mainly settled to westward of the 30th meridian and indeed after the 26th over practically the entire ocean area covered by reports received.

The accompanying table of ocean gales and storms includes two items from the Gulf of Mexico during the opening days of the month, from vessels that met the moderately severe storm that was described in the September REVIEW. Other items about winds on those days relate mostly to a storm near the 40th meridian in the area traversed by ships on the chief steamship lanes to northwestern Europe.

An important storm was centered near the Carolina coast on the 10th, and moved thence northeastward to Newfoundland on the 12th and onward to near southern Greenland on the 13th. The vessels which reported the storm at its greatest intensity were those to southward of Newfoundland during the afternoon and early evening hours of the 11th. Chart IX presents the situation on the 11th.

The lone report of hurricane strength (force 12) is connected with a storm between the Azores and Bermuda, about the 17th to 19th. The vessel was the British steamship *Ariguani*, eastbound. An unusually severe encounter with the same storm was reported in more detail by the westbound Italian liner *Vulcania*, which rated the storm as the worst met in 10 years. Windows and portholes were smashed and four persons on board suffered injuries On the whole, but few reports relating to this storm have come in; it was apparently of rather short duration and of small area, and did not advance far. A well-marked HIGH was located to northward at the time, near the chief steamship routes. Chart X presents the condition on the 19th.

About the 22d to 27th a long north-to-south trough of low pressure was over the eastern North Atlantic and the westernmost portions of Europe, and at times some of the centers within the trough were quite intense. Along the south coast of England there was marked damage on the 23d, newspaper reports indicate. The centers of this trough became less energetic by the 27th.

Fog.—In the Grand Banks area and to westward, almost as far as the longitude of Halifax, there was a notable increase of fogginess over September, and there was more fog than is normally expected during October. There was, however, little fog there during the first week and between the 15th and the 22d. The foggiest 5°-square for the whole North Atlantic was that between 40° and 45° N., 45° and 50° W., where there were 13 days with fog.

In nearly all other parts of the ocean, save a few small areas near the American coast to southward of Delaware Bay, fog was less frequent than it had been during September, also less frequent than usual in October. In fact, from the 40th meridian eastward to the coasts of Europe there was decidedly little fog reported, and near New England likewise there was comparatively little.

On October 1, two vessels were in collision in upper Delaware Bay because of fog, and a collision that day in New York harbor probably was connected with fog. In neither case was the damage very great. About October 20 a collision resulted from fog north of the Netherlands in the North Sea, and some loss of life is reported to have occurred.

OCEAN GALES AND STORMS, OCTOBER 1937

Vessel	Voyage		Position at time of lowest barometer		Gale began October—	Time of lowest barometer October—	Gale ended October—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Volendam, Du. S. S.	Rotterdam	New York	48 32 N.	43 16 W.	[1]30	Mdt. [1]30.	1	29.49	SE.	WSW, 8.	WNW.	WNW, 10.	SSW-WNW.
Black Gull, Am. S. S.	Antwerp	do	48 54 N.	33 24 W.	1	4 p, 1	2	29.50	SSW.	W, 9	NW.	W, 9	SSW-WNW.
Lysefjord, Nor. S. S.	New Orleans	Cienfuegos	[2]28 46 N.	88 56 W.	1	4 p, 1	2	29.81	ESE.	NE, 7	SSE.	SE, 9	NNE-SE.
Gulfprince, Am. S. S.	Port Arthur	Charleston	27 06 N.	89 30 W.	2	7 p, 1	2	29.76	ESE.	E, 5	ESE.	ESE, 8	
Black Gull, Am. S. S.	Antwerp	New York	47 30 N.	41 48 W.	3	10 a, 3	3	29.26	S.	SW, 9	NNW.	NW, 10	S-WNW.
Frode, Dan. S. S.	Heroen	Searsport	51 30 N.	42 50 W.	2	8 p, 3	4	29.19	N.	NE, 11	NW.	NE, 11	
Topa Topa, Am. S. S.	Antwerp	Tampa	43 20 N.	27 30 W.	4	2 p, 4	4	29.73	S.	S, 8	W.	S, 8	S-W.
Berlin, Ger. S. S.	Galway	New York	50 18 N.	41 18 W.	6	4 p, 6	6	29.57	SW.	SW, 8	N.	N, 10	SW-N.
Pipestone County, Am. S. S.	Havre	do	50 12 N.	18 30 W.	9	11 a, 8	10	29.76	ENE.	ESE, 4	ENE.	ENE, 9	ESE, E.
San Juan, Am. S. S.	San Juan	do	33 20 N.	71 30 W.	10	6 p, 10	10	29.70	WNW.	WNW, 8.	NW.	NW, 8	SW-NW.
Lubrafol, Belg. M. S.	Port Arthur	Antwerp	[3]39 15 N.	62 26 W.	10	10 a, 11	11	29.21	S.	S, 10	W.	W, 10	SSE-W.
Excalibur, Am. S. S.	Gibraltar	Boston	42 45 N.	68 50 W.	11	11 a, 11	11	29.42	E.	N, 9	NW.	N, 9	NE-N.
Cold Harbor, Am. S. S.	Cork	do	50 56 N.	32 51 W.	11	1 p, 11	12	29.82	WNW.	WNW, 9.	WNW.	WNW, 9	SSE-WNW.
American Shipper, Am. S. S.	New York	Cobh	42 51 N.	62 44 W.	10	1 p, 11	12	29.43	E.	SW, 8	NW.	WSW, 9	SW-WSW.
Collamer, Am. S. S.	Bordeaux	New York	42 30 N.	60 15 W.	11	2 p, 11	12	29.19	SSE.	SSE, 8	NW.	SW, 9	SSE-SW.
Alexandre Andre, Belg. M. S.	Manchester	Marcus Hook	42 17 N.	58 02 W.	11	3 p, 11	12	29.34	ESE.	S, 11	WNW.	S, 11	ESE-S-SW.
Scanyork, Am. S. S.	Copenhagen	New York	42 18 N.	62 54 W.	11	4p, 11	12	29.29	E.	WSW, 9	WNW.	W, 9	S-W.
Bergensfjord, Nor. S. S.	New York	Bergen	44 55 N.	56 40 W.	11	7p, 11	11	29.26	E.	SE, 9	S.	SE, 9	E-S.
Steel Navigator, Am. S. S.	Oran	Boston	43 30 N.	53 00 W.	11	Mdt, 11	13	29.63	SE.	S, 10	SW.	W, 10	SE-SW.
Boschdijk, Du. S. S.	Rotterdam	do	[3]43 46 N.	55 58 W.	11	3a, 12	12	29.43	SE.	SW, 7	W.	W, 9	SSW-WSW
Maasdam, Du. S. S.	do	Norfolk	48 48 N.	44 20 W.	16	1a, 16	16	29.43	WSW.	S, 6	W.	WSW, 9	SSE-W.
Mongiola, Ital. S. S.	Leixoes	Baltimore	35 10 N.	54 30 W.	17	10p, 17	18	29.92	NE.	NE, 8	NNE.	NE, 9	NW-NE-NNE
Vulcania, Ital. M. S.	Gibraltar	New York	37 53 N.	50 20 W.	18	10p, 18	19	29.44	SE.	NE, 8	N.	NNW, 10.	SE-NE-NNW.
Ariguani, Br. S. S.	Kingston	Avonmouth	38 26 N.	50 48 W.	17	3a, 19	19	29.39	NE.	NNE, 12.	ESE.	N, 12	N-E.
Falsterbo, Swed. M. S.	Cristobal	Liverpool	49 12 N.	18 49 W.	21	4p, 22	23	29.82	NNW.	WNW, 9.	NNW.	NW, 11	NW-WNW-NW.
Manhattan, Am. S. S.	Southampton	Cobh	50 40 N.	6 40 W.	23	4a, 23	23	28.59	NNW.	WNW, 3.	NNW.	NNW, 9.	SSE-W-NNW.
A. C. Bedford, Am. S. S.	New York	Corpus Christi	34 50 N.	74 45 W.	22	4a, 23	23	29.48	SSE.	SSE, 7	WNW.	SSE, 8	SSE-W.
Bienville, Am. S. S.	Mobile	Havre	49 15 N.	11 06 W.	22	7a, 23	24	28.74	NW.	NW, 9	WNW.	NW, 10	None.
New York, Ger. S. S.	New York	Cherbourg	49 51 N.	3 22 W.	23	Noon, 23.	24	28.40	SW.	SSW, 7	WNW.	NW, 10	S-NW.
Venezuela, Du. S. S.	Barbados	Plymouth	48 08 N.	9 40 W.	22	Noon, 23.	24	[2]29.25	NW.	NW, 8	NW.	NW, 10	None.
American Trader, Am. S. S.	London	New York	50 28 N.	0 50 W.	23	5p, 23	24	28.56	S.	SSW, 9	WSW.	SSW, 9	SSW-W.
New York, Ger. S. S.	Cherbourg	do	49 55 N.	14 09 W.	24	10 a, 24	24	28.99	Shifting	NNE, 5	NNW.	NNW, 10.	E-N.
American Trader, Am. S. S.	London	do	[3]49 53 N.	11 02 W.	24	10p, 24	26	28.84	NE.	NE, 6	NNW.	N, 9	NE-N.
Examelia, Am. S. S.	Lisbon	do	[3]37 37 N.	23 43 W.	25	1a, 25	25	29.83	NW.	NW, 7	N.	NW, 8	
American Shipper, Am. S. S.	Belfast	Boston	51 00 N.	9 00 W.	25	9a, 25	26	28.61	NE.	NNE, 9	N.	NNW, 9	NE-NW.
Falsterbo, Swed. M. S.	Cristobal	Liverpool	51 18 N.	8 19 W.	24	Noon, 25.	25	29.09	ENE.	NNW, 11.	NNW.	NNW, 11.	NNE-NNW.
Motocarline, Pan. M. S.	Baytown	Rotterdam	[3]45 02 N.	21 23 W.	24	1p, 25	26	29.43	NW.	NW, 10	NNW.	NW, 10	None.
Kekoskee, Am. S. S.	New York	Galveston	35 35 N.	75 15 W.	28	8p, 27	28	29.46	W.	SW, 3	WSW.	WSW, 8	
Europa, Ger. S. S.	Bremen	New York	42 36 N.	56 29 W.	31	7a, 31	31	29.57	SW.	W, 8	NW.	W, 10	
NORTH PACIFIC OCEAN													
Golden Tide, Am. S. S.	Cebu	San Francisco	17 20 N.	129 20 E.	[1]30	2a, 1	1	29.76	E.	SE, 8	SE.	SE, 8	ESE-SE.
Nako Maru, Jap. M. S.	Yokohama	Los Angeles	44 35 N.	171 54 E.	3	2p, 4	4	29.49	ESE.	SE, 9	SSW.	SE, 9	SE-S-SW.
President McKinley Am. S. S.	Victoria, B. C.	Yokohama	46 58 N.	161 20 E.	3	Noon, 4	4	29.26	SE.	NE, 5	NW.	NW, 9	E-NNW.
Jefferson Myers, Am. S. S.	Balboa	San Diego	15 54 N.	97 42 W.	5	2p, 6	7	29.75	ESE.	ESE, 7	ESE.	ESE, 7	ENE-ESE.
President Jackson, Am. S. S.	Yokohama	Victoria, B. C.	46 36 N.	167 00 E.	6	2p, 7	7	29.41	SE.	SE, 5	ESE.	ESE, 9	ESE-S.
Fujisan Maru, Jap. M. S.	do	Port San Luis	38 27 N.	151 38 E.	9	6p, 9	10	29.42	ESE.	NNE, 9.	NNW.	N, 10	ESE-N.
Golden Tide, Am. S. S.	Cebu	San Francisco	37 14 N.	162 25 E.	9	7a, 10	10	29.65	SSE.	WSW, 9.	NNW.	WSW, 9.	SSW-W.
Silverguava, Br. M. S.	Manila	Portland, Oreg.	50 30 N.	162 00 W.	10	6a, 11	11	28.48	ESE.	SW, 8	WSW.	SW, 11	S-SW.
Golden Tide, Am. S. S.	Cebu	San Francisco	39 50 N.	179 18 W.	12	8p, 12	13	29.31	E.	NNE, 7	NE.	E, 9	E-NNE-NE.
Atago Maru, Jap. M. S.	Yokohama	Honolulu	34 04 N.	161 15 E.	11	Noon, 13.	14	29.33	ENE.	SW, 5	N.	N, 9	SW-WNW.
Mobile City, Am. S. S.	Balboa	Los Angeles	[3]14 31 N.	94 16 W.	14	4p, 14	15	29.76	N.	N, 4	N.	N, 9	WNW-N.
Sanyo Maru, Jap. M. S.	Yokohama	San Francisco	41 05 N.	152 30 E.	14	1p, 15	16	29.24	E.	S, 9	NW.	SE, 10	
Tyndareus, Br. S. S.	Vancouver, B.C.	Yokohama	48 36 N.	172 12 E.	18	3p, 18	19	29.37	W.	SSW, 6	WNW.	W, 8	SSE-W.
H. M. Storey, Am. S. S.	Vladivostock	Dutch Harbor	54 18 N.	175 54 W.	18	Mdt., 18	20	29.40	SE.	N, 7	NW.	N, 9	NE-N.
Sanyo Maru, Jap. M. S.	Yokohama	San Francisco	47 42 N.	164 04 W.	18	10p, 19	20	28.79	WNW.	NW, 9	W.	NW, 9	
Steel Traveler, Am. S. S.	Honolulu	Osaka	[3]32 15 N.	143 37 E.	18	6a, 20	20	29.47	SSE.	S, 6	N.	N, 10	S-NW.
Ogura Maru, Jap. M. S.	Yokohama	San Francisco	40 00 N.	159 30 W.	20	1p, 20	20	29.33		WNW, 8		WNW, 8	
Kinai Maru, Jap. M. S.	Los Angeles	Yokohama	34 32 N.	160 50 W.	20	1p, 20	21	29.60	NW.	W, 4	W.	NW, 9	W-NW.
Empress of Russia, Br. S. S.	Victoria, B. C.	do	52 07 N.	158 13 W.	19	2a, 20	21	28.03	SE.	SE, 6	NW.	NW, 9	S-E-NE.
Do	do	do	50 13 N.	176 02 E.	23	4p, 23	23	29.29	W.	W, 7	W.	NW, 9	W-NW.
Indianan, Am. S. S.	Balboa	San Diego	14 06 N.	93 48 W.	23	6p, 23	24	29.79	N.	N, 3	N.	N, 7	NW-N.
Ohioan, Am. S. S.	San Francisco	Balboa	20 00 N.	106 15 W.	24	2a, 25	25	29.73	SE.	E, 8	ESE.	E, 8	SE-E.
Minnesotan, Am. S. S.	Los Angeles	do	20 58 N.	107 32 W.	25	4p, 25	27	29.65	E.	E, 8	ESE.	E, 8	
McDougal, U. S. N.	Balboa	San Diego	20 07 N.	106 12 W.	25	4p, 25	25	29.68	ESE.	SE, 8	NE.	ESE, 8	SE-NE.
Indianan, Am. S. S.	do	do	19 48 N.	105 54 W.	26	5a, 27	27	29.68	SE.	E, 6	NE.	ESE, 8	E-N.
H. M. Storey, Am. S. S.	Dutch Harbor	Port San Luis	44 54 N.	133 36 W.	26	3a, 27	27	29.47	W.	S, 8	SSW.	SSW, 9	W-S-SSW.
Mauna Ala, Am. S. S.	Seattle	Honolulu	41 36 N.	136 18 W.	26	8a, 27	27	29.32	SW.	SSW, 8	WNW.	SSW, 8	SSW-W.
San Ramon Maru, Jap. M. S.	Yokohama	Los Angeles	46 03 N.	158 10 W.	29	Mdt. 29	29	29.74	W.	W, 6	W.	W, 8	
President Jefferson, Am. S. S.	do	Victoria, B. C.	50 00 N.	151 57 W.	29	4a, 30	30	29.32	W.	WSW, 6	WSW.	SW, 9	
Kentucky, Am. S. S.	Cabaobaran, P. I.	San Francisco	42 04 N.	142 11 W.	30	Mdt. 30	31	29.31	SE.	SSE, 9	SW.	SSE, 9	SSE-SW.
San Ramon Maru, Jap. M. S.	Yokohama	Los Angeles	44 39 N.	149 19 W.	30	6a, 31	[4]1	29.13	NNW.	NW, 10	W.	NW, 10	N-NW.
President Jefferson, Am. S. S.	do	Victoria, B. C.	50 00 N.	143 48 W.	31	Noon, 31.	31	29.11	E.	E, 9	ESE.	ESE, 9	E-ESE.
Mana, Am. S. S.	Portland, Oreg.	Honolulu	42 35 N.	131 56 W.	31	9p, 31	31	29.72	SSE.	SE, 8	W.	SE, 8	SE-W.

[1] September.
[2] Barometer uncorrected.
[3] Position approximate.
[4] November.

NORTH PACIFIC OCEAN, OCTOBER 1937

By WILLIS E. HURD

Atmospheric pressure.—Almost continuous cyclonic activity occurred over north-central waters of the North Pacific Ocean during October 1937, and as a result the average pressure over the Aleutian Islands and contiguous regions was lower than the normal for the month. At Dutch Harbor, near the center of the LOW, the average pressure, 29.31 inches (0.34 inch below the normal) was the lowest for the month since 1923, when it was 29.29. The lowest barometer reading of the month was 28.03, reported by the British steamer *Empress of Russia*, on the 20th, in 52°07′ N., 158°13′ W.

The North Pacific high-pressure area this month lay on the average over south-central waters, with its crest at Midway Island where the average barometer was 30.07. This was considerably to the southwestward of the normal position of the anticyclone's center.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, October 1937, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	29.85	+0.02	30.26	11	29.44	23
Dutch Harbor	29.31	− .34	30.08	7	28.30	19
St. Paul	29.48	− .15	30.20	7	29.00	23
Kodiak	29.42	− .17	30.02	8	28.76	20
Juneau	29.78	− .09	30.24	31	29.12	23
Tatoosh Island	30.00	− .01	30.45	6	29.40	27
San Francisco	29.99	− .02	30.14	6	29.85	11
Mazatlan	29.83	− .01	29.88	21, 44	29.74	27
Honolulu	30.00	.00	30.12	31	29.82	21
Midway Island	30.07	+ .04	30.18	30	29.82	14
Guam	29.82	− .02	29.92	22	29.65	13
Manila	29.82	+ .02	29.97	26	29.59	14
Hong Kong	29.93	− .02	30.10	26	29.52	4
Naha	29.94	+ .04	30.15	26	29.59	16
Chichishima	29.95	+ .04	30.15	29	29.54	19

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Extratropical cyclones and gales.—Cyclones of higher latitudes were numerous and in several instances during October 1937 were characterized by marked depressions of the barometer. Considering the fact that at Dutch Harbor daily pressures were below the normal of the month except on three days, it may be seen that cyclonic activity was present almost without intermission over the Aleutian Islands and vicinity. The average pressures of these storms were much lower than had occurred during October in recent years. Notwithstanding this, there was little if any increase over the normal in the number and intensity of the gales reported. There was, however, a shift in the region of greatest storminess, from the normal location in the northwestern quarter of the ocean to northeastern waters. The great southward extension of several of the northeastern LOWS into the region usually occupied by the Pacific anticyclone, resulted in the latter being displaced to the southwestward.

In east longitudes there were 9 or 10 days, all from the 4th to 23d, on which gales of forces 8–10, due to extratropical cyclonic activity, were reported by ships. In half these instances the high winds occurred about half way between Midway Island and central Japan; the remainder occurred south to southwest of the western Aleutians.

In west longitudes most extratropical gales of the month, of forces 8–11, were met between latitudes 40° and 54° N., longitudes 130° and 165° W., on approximately 15 days of the month, from the 11th to 31st.

The storm which caused the earliest heavy weather of the month in northeastern waters came from the vicinity of the Kuril Islands on October 6. It crossed the central Aleutians during the 9th and 10th, and on the 11th, then of considerable extent, was centered south of the Alaska Peninsula. Early on this date the eastbound British motorship *Silverguava* in 50°½ N., 162° W., reported the lowest reading, 28.48, in connection with the storm, and at 2 p. m., a wind of force 11, from the southwest, the highest reported by any ship this month in North Pacific waters. Thereafter the storm moved northeastward with decreasing energy and entered the continent from the Gulf of Alaska on the 16th.

Another energetic Aleutian storm appeared over the southern part of the Bering Sea on the 18th. On the 19th, as it moved eastward, pressure at Dutch Harbor fell to 28.30 inches, and on the Japanese steamer *Hiye Maru*, near 52° N., 165° W., to 28.26. Gales of force 9, meanwhile, were experienced in localities considerably to the southward and eastward, with barometer depressed below 29 inches over a wide area. Force-9 gales continued through the 20th and 21st along the northern routes southeast of the Alaska Peninsula, as the storm moved slowly eastward, with central pressures reported by two ships on the 20th as almost down to 28 inches. Late on the 21st the storm suddenly turned to the north, then northwest, with decreased energy, and by the 24th, after a recurve to westward in the Bering Sea, had almost described a loop since the 18th.

From the 27th to 31st stormy weather prevailed within the region 40°–50° N., 130°–150° W., with gales of force 9 reported locally, except on the 31st, when a northwest gale of force 10 was encountered by the Japanese motorship *San Ramon Maru* near 45° N., 149° W., barometer 29.13. The center of the disturbance at the end of the month lay near 43° N., 144° W., with lowest pressure 28.73 inches.

Tropical disturbances in the Far East.—In the absence of the October typhoon report from Manila, brief mention is made here of such disturbed conditions as appear from our charts and other data to have existed in the tropics of the Far East during the month.

On October 1 the American steamer *Golden Tide* experienced a southeast gale of force 8, barometer 29.76, in 17°20′ N., 129°20′ E., caused by a depression east of Luzon. The LOW moved northwestward into the China Sea, and on the 3d and 4th lay south of Hong Kong as a typhoon of considerable energy with winds up to force 11 on the 4th, pressure down to 29.38. The later history of the storm is not known.

On October 13 and 14 another depressed area lay east of the northern Philippines, moving toward Taiwan. On the 15th, when central near 20° N., 124° E., the disturbance recurved to northeast, and passed south of the Nansei Islands on the 16th. At Naha on this date one observation reported a northeast gale of force 10, barometer 29.59. The storm passed to the westward of the Ogasawara Islands on the 18th and lay north and northeast of them on the 19th and 20th. A report from the American steamer *Steel Traveler* on the 20th gave a north gale of force 10, barometer 29.47, near 32° N., 143°–144° E. The storm thereafter apparently dissipated; at least it was lost to observation.

Tropical disturbances in Mexican west coast waters.—One tropical cyclone occurred off the west coast of Mexico this month, and there were signs of the formation of three other localized disturbances. The first of these is evidenced only by a mild cyclonic circulation centered south

of the Gulf of Tehuantepec on October 6, with a report from the American steamer *Jefferson Myers* of experiencing an east-southeast wind of force 7, barometer 29.75, in 15°54′ N., 97°42′ W., accompanied by a wind shift from east-northeast. The second, in which no strong winds were experienced, is evidenced by a report from the American steamer *West Cactus* of a "cyclonic circulation" observed on October 12 in 24° N., 115° W. The third is shown by an observation of a north gale of force 9, barometer 29.76, reported by the American steamer *Mobile City*, on the 14th, near 14½° N., 94° W.

Late on October 24 a cyclone appeared at some distance south of the Revillagigedo Islands. It moved rapidly northeastward during the following 24 hours and from late on the 24th to and including the 27th lay close off the Mexican coast between Cape Corrientes and Manzanillo, where it appears to have disintegrated. The first observation received in connection with the cyclone was from the American steamer *Steel Mariner*, late on the afternoon of the 24th. The ship, near 16° N., 109½° W., reported a south-southeast gale of force 9, barometer 29.71. During the 25th the American steamers *Ohioan* and *Minnesotan*, and the U. S. S. *McDougal* reported east to southeast gales of force 8, lowest barometer 29.65, within the locality 20°00′ to 20°58′ N., 106°12′ to 107°32′ W.; and the American steamer *Katrina Luckenbach*, a south-southeast gale of force 9, barometer 29.59, in 19°30′ N., 106°48′ W. The disturbed condition was slightly closer to the coast on the 26th, with the American steamer *Indianan* reporting an east-southeast gale of force 8, barometer 29.68 in 19°48′ N., 150°54′ W. By the 27th the LOW had moved slightly to the southeastward near Manzanillo prior to its disappearance.

Fog.—Fog was observed on only a few days in scattered localities along the northern routes this month. In Californian coastal waters it was reported on 10 days, and off Lower California on 5 days.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—*Condensed climatological summary of temperature and precipitation by sections, October 1937*

[For description of tables and charts, see REVIEW, January, p. 29]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	63.1	−1.6	Evergreen	98	6	St. Bernard	23	24	6.00	+2.98	Mobile Airport	14.98	Cochrane	2.65
Arizona	63.6	+2.0	5 stations	103	[1] 2	Fort Valley	19	20	.38	−.49	Rucker Canyon	3.36	41 stations	.00
Arkansas	60.8	−1.7	Subiaco	96	6	Lead Hill	17	23	4.66	+1.45	Portland	9.05	Highland	.98
California	61.6	+1.1	Indio	104	21	Boca	10	8	1.03	−.19	Crescent City (near)	8.72	45 stations	.00
Colorado	49.3	+2.6	2 stations	93	[1] 3	Dillon	9	20	.84	−.32	Steamboat Springs	2.54	Greeley	T
Florida	71.3	−1.8	Davenport	97	4	Mason	29	24	4.93	+.66	Stuart	18.81	Bradenton	1.01
Georgia	62.4	−2.5	Hawkinsville	96	6	Blairsville	20	24	5.38	+2.55	Gillsville	11.27	Thomasville	1.50
Idaho	49.7	+2.7	Malad	88	2	Soldier Creek	10	5	1.25	−.21	Deception Creek	3.96	Hailey	.22
Illinois	53.1	−1.9	2 stations	92	1	2 stations	17	15	3.52	+.76	Palestine	7.30	Keithsburg	1.03
Indiana	52.6	−2.1	Johnson	95	1	Salamonia	19	15	4.74	+1.94	Williams	7.74	Angola	2.12
Iowa	50.3	−1.1	Ottumwa	94	1	3 stations	12	14	2.03	−.34	Postville (near)	4.28	Oakland	1.06
Kansas	57.2	+.2	3 stations	96	[1] 4	Horton	18	23	1.43	−.52	Chapman	2.67	Sublette	.39
Kentucky	55.7	−2.5	Williamstown	93	1	Farmers	17	15	4.27	+1.47	Pippapass	7.30	Cynthiana	2.17
Louisiana	67.1	−1.3	Morgan City	97	5	2 stations	28	23	9.49	+6.12	Belle Chasse	29.04	St. Joseph	3.82
Maryland-Delaware	53.7	−2.4	Cumberland, Md.	87	6	Oakland, Md.	14	25	7.07	+4.05	Laurel, Md.	10.07	Delaware Breakwater, Del.	3.48
Michigan	46.0	−3.1	Adrain	90	1	Sidnaw	11	23	2.69	−.15	Manistee	5.68	Owosso	1.17
Minnesota	43.6	−2.6	Wheaton	87	3	Meadowlands	0	22	1.08	−.79	Pigeon River Bridge	3.40	Gonvick	.03
Mississippi	63.3	−2.0	Columbus	95	[1] 6	Eupora	25	24	5.14	+2.48	Bay St. Louis	14.74	Philadelphia	2.22
Missouri	56.3	−1.0	Warsaw	98	5	Grant City	15	23	2.44	−.47	Caruthersville	7.12	Altona	.65
Montana	48.1	+3.5	Broadus	89	3	Wisdom	14	26	.94	−.08	Flatwillow (near)	2.89	Choteau	T
Nebraska	51.8	+.3	3 stations	95	4	3 stations	15	14	1.51	+.01	Hartington	3.96	Kimball	.28
Nevada	54.1	+3.6	Logandale	97	[1] 11	San Jacinto	11	6	.28	−.27	Sheldon	1.05	7 stations	.00
New England	48.4	−1.1	Enosburg Falls, Vt.	84	6	Somerset, Vt.	11	17	4.93	+1.38	Pinkham Notch, N. H.	10.79	Cornwall, Vt.	2.71
New Jersey	53.2	−1.5	Bridgeton	84	2	Runyon	15	17	5.27	+1.86	Lakewood	10.33	Sussex	3.61
New Mexico	55.4	+1.7	2 stations	69	[1] 2	Therma	11	19	1.14	+.01	Eick's Ranch	3.32	2 stations	.00
New York	48.1	−1.8	Geneva	90	6	2 stations	12	[1] 16	4.77	+1.43	High Market	9.25	Scotia	2.42
North Carolina	57.4	−2.5	Kinston	95	7	Mount Mitchell	10	[1] 24	5.10	+1.69	Mount Airy	12.13	Willard	.70
North Dakota	43.9	+.2	Wishek	94	3	Ashley	1	14	.80	−.22	Hansboro	3.15	2 stations	T
Ohio	51.8	−1.6	Van Wert	91	1	McArthur	19	15	3.39	+.80	New Carlisle	5.85	Paulding	1.83
Oklahoma	61.8	−.4	2 stations	101	[1] 5	2 stations	20	23	2.54	−.45	Marietta	8.23	Kenton	.59
Oregon	52.2	+2.5	Powers	89	[1] 8	Danner	14	6	2.39	+.50	Valsetz	8.53	Paisley	.34
Pennsylvania	50.6	−1.9	2 stations	89	[1] 1	Emporium	12	17	5.84	+2.58	Mount Pocono	10.40	Beaver Falls	2.98
South Carolina	60.9	−2.9	3 stations	94	7	Caesars Head	23	24	4.46	+1.42	Caesars Head	15.18	Rimini	1.10
South Dakota	48.8	+.4	Cottonwood	92	3	2 stations	5	14	.47	−.71	Vermillion	3.15	3 stations	T
Tennessee	57.4	−2.2	Tiptonville	93	6	Paris	20	24	5.61	+2.70	Morgan Springs	10.16	New River	2.09
Texas	67.9	+.2	Seymour	106	5	Mount Pleasant	27	23	2.96	+.20	Bonham	8.32	Gail	T
Utah	51.6	+2.6	Blanding	90	3	Woodruff	14	29	1.13	+.04	High Line City Creek	4.08	2 stations	.00
Virginia	54.0	−3.3	2 stations	89	[1] 2	2 stations	18	15	7.54	+4.50	Pinnacles	14.05	Diamond Springs	2.47
Washington	53.0	+3.4	South Bend	89	22	do	22	[1] 3	2.79	−.47	Quinault	17.90	Waterville	.06
West Virginia	51.6	−3.0	Grafton	91	[1] 2	Bayard	11	25	6.99	+4.09	Bayard	11.14	New Cumberland	3.55
Wisconsin	44.9	−3.2	3 stations	84	[1] 1	Danbury	8	23	3.08	+.60	Wisconsin Dells	5.06	Iron River	.84
Wyoming	46.3	+2.8	Arvada	91	5	South Pass City	5	19	1.02	−.06	Bechler River	3.29	Recluse	.07
Alaska (September)	47.2	+3.6	Richardson	83	5	Allakaket	17	13	3.86	+.40	Little Port Walter	28.03	Kotzebue	.09
Hawaii	74.6	+.9	2 stations	92	[1] 4	Kanaloholuhulu	35	25	6.16	+.70	Keauhou No. 2	24.33	Pearl Harbor, T. H.	.49
Puerto Rico	78.1	+.8	Caguas	97	2	Garzas	56	11	7.74	−.10	Guineo Reservoir	18.81	Camuy	1.42

[1] Other dates also.

TABLE 2.—*Climatological data for Weather Bureau stations, October 1937*
(Compiled by Annie E. Small, by official authority U. S. Weather Bureau.)

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
New England							50.2	−0.8										75	4.38	+1.1										6.0		
Eastport	76	67	85	29.94	30.02	+0.02	48.0	+0.5	66	5	54	32	17	42	22	44	41	80	2.78	−.8	14	12.2	sw.	35	s.	24	9	7	15	6.4	0.0	0.0
Greenville, Maine	1,070	6	40	29.90	29.99	.....	44.2	.....	78	5	54	20	14	34	41	40	37	.....	7.18	+3.5	13	5.6	s.	25	.....	30	8	6	17	.....	T	.0
Portland, Maine	103	82	117	29.90	30.02	−.02	49.4	−.5	70	7	56	31	17	42	24	44	39	72	5.16	+2.0	12	10.5	sw.	35	s.	23	15	6	10	4.8	T	.0
Concord	289	60	.....	29.72	30.03	−.02	47.6	−2.1	76	5	58	21	17	37	39	.....	.....	.....	4.51	+1.7	5	.....	ne.	.....	.....	.....	4	13	14	.....	.0	.0
Burlington	403	11	48	29.55	30.00	−.04	47.6	−1.6	78	6	56	22	14	40	28	43	38	73	2.89	−.1	15	11.2	s.	39	se.	23	0	14	17	7.4	T	.0
Northfield	876	12	60	29.06	30.02	−.02	44.5	−1.0	78	6	55	16	17	34	35	40	37	79	3.59	+.7	15	8.2	s.	27	s.	23	2	10	19	7.5	T	.0
Boston [1]	29	33	62	30.00	30.03	−.02	52.6	−1.0	74	5	60	32	17	45	26	47	42	73	3.95	+.8	8	12.1	s.	48	s.	20	6	12	13	6.3	.0	.0
Nantucket	12	14	90	30.03	30.04	−.01	53.7	−.5	72	5	59	40	17	48	20	50	47	78	4.37	+1.0	10	14.5	s.	45	ne.	10	11	6	14	5.8	.0	.0
Block Island	26	11	46	30.02	30.05	.00	53.4	−1.5	69	5	58	39	15	48	17	49	45	75	3.42	−.1	8	15.7	s.	36	nw.	31	12	9	10	5.1	.0	.0
Providence	159	215	251	29.87	30.05	.00	51.6	−.6	73	7	60	30	17	44	25	47	42	74	4.06	+.9	8	11.7	nw.	47	nw.	30	11	10	10	5.6	.0	.0
Hartford	159	66	100	29.87	30.05	−.01	51.6	+.4	76	6	60	26	17	43	30	.....	.....	.....	4.83	+1.3	9	8.5	s.	30	s.	20	9	10	12	5.7	.0	.0
New Haven	106	74	153	29.94	30.06	.00	52.4	−1.4	73	7	60	31	17	45	27	47	43	74	5.80	+2.1	11	9.5	n.	30	w.	30	9	10	12	5.7	.0	.0
Middle Atlantic States							54.4	−2.0										73	5.78	+2.7									6.3		
Albany	97	97	112	29.93	30.04	−.02	51.2	−.9	81	6	60	27	17	43	27	45	40	71	2.61	−.1	15	8.3	s.	27	se.	23	3	14	14	6.9	.0	.0
Binghamton	871	57	79	29.09	30.03	−.03	49.2	−.8	81	6	58	21	17	40	35	.....	.....	.....	5.89	+2.9	18	6.9	nw.	21	w.	30	2	7	22	7.9	T	.0
New York	314	415	454	29.71	30.05	−.01	54.6	−1.7	76	7	61	35	15	48	26	48	43	68	4.12	+.6	13	15.9	nw.	47	se.	23	8	9	14	6.1	T	.0
Harrisburg	374	94	104	29.65	30.05	−.03	52.8	−2.0	80	6	61	31	25	45	26	46	41	71	6.76	+3.8	12	7.6	w.	27	ne.	28	5	12	14	6.5	T	.0
Philadelphia	114	174	367	29.94	30.07	.00	55.0	−2.8	79	2	64	35	15	47	27	49	44	70	5.24	+2.4	13	13.1	nw.	36	ne.	28	8	9	14	5.9	.0	.0
Reading	323	283	306	29.70	30.05	.....	54.0	−.7	79	2	62	31	17	46	26	47	42	71	5.37	+2.2	12	11.9	nw.	47	ne.	28	7	8	16	6.7	T	.0
Scranton	805	72	104	29.17	30.04	−.03	50.4	−1.5	79	6	59	24	17	42	34	45	41	74	6.02	+3.0	16	6.8	sw.	29	nw.	30	4	13	14	6.5	T	.0
Atlantic City	52	37	172	30.00	30.05	−.02	56.0	−.9	77	7	63	32	15	49	24	51	47	75	5.43	+2.2	12	16.8	w.	46	se.	20	8	10	13	6.0	.0	.0
Sandy Hook	22	10	57	30.02	30.04	.....	55.0	−1.9	75	6	60	38	15	50	21	50	45	73	4.55	+.8	13	15.4	s.	44	s.	20	9	8	14	5.8	.0	.0
Trenton	190	88	106	29.84	30.05	.....	53.8	−1.8	76	5	63	32	15	45	31	48	43	72	4.35	+1.6	11	9.2	s.	30	n.	28	7	10	14	6.4	.0	.0
Baltimore	123	100	215	29.92	30.05	−.03	56.2	−2.0	79	2	64	36	25	48	30	50	45	71	7.75	+4.9	13	10.9	sw.	38	se.	23	8	11	12	6.0	.0	.0
Washington	112	62	85	29.93	30.05	−.03	55.3	−2.1	82	6	64	31	25	47	30	49	45	75	8.81	+6.0	12	6.8	nw.	22	nw.	30	6	13	12	6.2	.0	.0
Cape Henry	18	8	54	30.03	30.05	.....	60.0	−2.1	86	7	66	41	24	54	30	55	51	76	4.51	+1.5	13	13.7	sw.	35	n.	10	8	10	13	5.9	.0	.0
Lynchburg	686	148	184	29.33	30.07	−.02	55.3	−3.2	85	30	65	31	16	45	33	48	44	73	7.91	+4.8	14	7.0	nw.	25	sw.	21	9	9	13	5.8	.0	.0
Norfolk	91	80	125	29.97	30.07	.00	59.6	−2.9	86	7	67	40	15	52	32	53	49	75	3.98	+.9	13	10.3	w.	29	s.	19	9	7	15	6.2	.0	.0
Richmond	144	11	52	29.91	30.07	−.01	56.4	−3.2	84	7	66	33	15	46	32	50	46	78	6.34	+3.5	13	7.8	ne.	23	sw.	21	9	11	11	5.5	.0	.0
Wytheville	2,304	49	55	.....	30.08	−.01	49.5	−4.1	78	6	58	26	15	40	33	.....	.....	78	8.58	+5.7	13	6.7	w.	24	w.	20	7	7	17	.....	2.9	.0
South Atlantic States							61.8	−2.4										77	4.47	+1.2									5.3		
Asheville	2,253	89	104	27.72	30.09	.00	52.4	−2.9	82	6	63	28	24	42	41	46	43	79	5.89	+3.1	13	8.5	n.	34	n.	27	8	10	13	6.3	.9	.0
Charlotte	779	63	86	29.22	30.07	−.01	58.4	−3.3	88	7	68	34	15	49	36	51	47	73	4.70	+1.8	14	7.2	ne.	20	nw.	22	11	7	13	5.7	.0	.0
Greensboro [1]	886	6	56	29.10	30.07	.....	55.2	.....	85	7	66	29	15	45	40	49	46	81	4.91	.....	12	9.2	ne.	26	nw.	27	11	6	14	5.7	.0	.0
Hatteras	11	5	50	30.04	30.05	−.01	63.8	−2.1	80	6	69	46	26	58	22	59	56	79	8.26	+3.3	15	13.7	ne.	34	s.	22	13	3	15	5.6	.0	.0
Raleigh	376	103	140	29.65	30.05	−.02	59.2	−2.8	87	7	68	33	15	50	36	53	49	78	3.54	+.7	13	9.5	ne.	21	se.	18	10	10	11	5.3	.0	.0
Wilmington	72	73	107	29.98	30.05	−.01	62.8	−2.5	88	7	72	38	24	54	27	56	53	78	1.78	−1.5	14	8.8	ne.	24	nw.	20	14	8	9	4.5	.0	.0
Charleston	48	11	92	30.00	30.04	−.02	65.2	−2.6	88	7	72	38	24	58	23	59	55	77	2.68	−.6	7	11.4	ne.	29	e.	17	13	5	13	5.4	.0	.0
Columbia, S. C	347	70	91	29.68	30.07	.00	62.0	−2.3	89	7	71	33	24	52	34	54	48	69	2.28	−.3	11	9.0	ne.	26	sw.	19	15	7	9	4.5	.0	.0
Greenville, S. C	1,039	139	.....	.....	.....	.....	57.1	−3.1	89	8	66	29	24	48	37	.....	.....	.....	10.99	+7.9	10	.....	ne.	.....	.....	.....	13	4	14	.....	.0	.0
Augusta	182	62	77	29.84	30.04	−.03	63.2	−2.1	91	7	73	34	24	53	38	55	51	73	2.69	+.2	10	6.7	ne.	26	nw.	22	12	8	11	4.8	.0	.0
Savannah	65	73	152	29.96	30.04	−.01	66.4	−1.5	92	7	75	36	24	58	33	59	56	78	3.76	+.8	9	10.9	e.	36	nw.	27	14	3	14	5.3	.0	.0
Jacksonville	43	86	110	29.97	30.02	.00	69.5	−1.6	92	5	77	39	24	62	28	62	59	79	2.61	−1.8	12	8.2	e.	25	nw.	22	11	6	14	5.7	.0	.0
Florida Peninsula							75.4	−0.7										78	5.12	−0.6									4.4		
Key West	22	10	64	29.92	29.94	.00	78.8	−.3	90	14	84	62	30	73	20	72	70	79	4.59	−1.4	15	9.1	e.	27	sw.	22	13	16	2	4.1	.0	.0
Miami	25	124	168	29.94	29.96	−.01	77.0	.0	89	5	83	53	24	71	22	70	68	77	5.00	−3.4	15	8.9	se.	25	w.	22	15	10	6	4.0	.0	.0
Tampa	35	88	197	29.95	29.99	+.01	73.8	−.5	91	6	82	46	24	66	25	66	63	78	2.88	−.2	9	11.2	e.	30	n.	22	11	8	12	5.1	.0	.0
Titusville	43	5	36	29.93	29.98	.....	72.2	−2.0	91	4	81	40	25	64	31	66	65	.....	8.00	+2.4	16	.....	ne.	.....	.....	.....	9	9	13	.....	.0	.0
East Gulf States							64.3	−2.3										77	7.66	+4.8									4.9		
Atlanta [1]	976	5	53	29.02	30.04	−.03	58.8	−4.2	85	7	68	29	24	50	36	52	49	80	6.30	+3.7	12	9.1	nw.	28	nw.	28	15	3	13	5.3	.0	.0
Macon	370	79	87	29.65	30.05	−.01	63.5	−1.0	89	7	73	32	24	54	40	56	51	74	3.96	+1.6	12	7.8	nw.	21	nw.	27	11	9	11	5.1	.0	.0
Thomasville	273	49	58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Apalachicola	35	11	.....	29.96	30.00	.....	69.2	−1.4	87	5	76	42	24	62	24	64	61	81	2.08	−1.1	11	9.5	nw.	30	se.	17	12	6	13	5.1	.0	.0
Pensacola	56	149	185	29.95	30.01	−.02	67.4	−2.5	91	7	74	38	23	60	24	62	59	79	9.66	+5.5	13	12.6	nw.	40	se.	17	16	7	8	4.2	.0	.0
Anniston	741	9	.....	.....	.....	.....	59.6	−2.8	86	4	68	26	24	51	36	.....	.....	.....	5.41	+2.8	1	.....	nw.	.....	.....	.....	15	4	12	.....	.0	.0
Birmingham	700	11	48	29.27	30.03	−.04	61.4	−3.4	89	6	71	30	24	52	32	54	51	76	6.60	+4.2	12	7.3	e.	28	se.	18	12	9	10	5.1	.0	.0
Mobile	57	86	161	29.95	30.01	−.03	66.8	−2.5	91	7	76	37	24	58	29	61	58	80	11.43	+7.8	9	10.2	nw.	32	se.	17	12	9	10	5.0	.0	.0
Montgomery	218	92	105	29.79	30.04	−.02	64.0	−2.6	91	6	73	33	24	55	31	57	53	74	4.81	+2.4	13	7.4	n.	19	nw.	18	13	6	12	5.1	.0	.0
Meridian	375	67	92	29.63	30.03	−.03	63.1	−1.2	92	6	74	31	24	52	36	56	52	78	5.18	+2.8	10	6.3	ne.	20	se.	17	13	8	10	4.8	.0	.0
Vicksburg	247	82	102	29.75	30.01	−.05	64.0	−2.7	88	6	73	34	23	55	29	57	53	74	3.75	+1.0	12	8.8	n.	20	se.	17	13	9	9	4.7	.0	.0
New Orleans	53	76	84	29.95	30.00	−.03	69.7	−1.3	90	7	77	45	23	62	24	63	60	77	25.11	+21.8	12	7.7	ne.	22	ne.	16	15	6	10	4.5	.0	.0
Port Eads, La	9	4	35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Gulf States							68.5	+0.6										69	3.56	+0.5									3.2		
Shreveport	249	92	227	29.76	30.03	−.02	66.4	−.2	90	5	76	36	23	56	32	58	53	71	4.96	+2.3	7	11.0	ne.	28	nw.	19	16	10	5	3.8	.0	.0
Bentonville	1,303	12	38	28.69	30.06	+.01	58.3	+.3	91	6	70	25	23	46	44	.....	.....	.....	2.89	−.7	7	5.8	sw.	19	nw.	18	15	8	8	.....	.0	.0
Fort Smith	457	79	94	29.57	30.05	.00	62.3	−.5	94	6	73	30	23	52	36	53	47	64	2.39	−.6	9	6.9	e.	22	w.	19	18	7	6	3.8	.0	.0
Little Rock	357	94	102	29.66	30.04	−.02	61.0	−2.6	88	6	70	31	23	52	33	54	49	71	5.00	+2.3	9	8.0	e.	32	w.	19	18	3	10	3.6	.0	.0
Austin	605	68	90	29.36	29.99	.....	70.4	+2.1	95	4	82	42	23	58	36	60	54	66	4.70	+1.5	5	7.5	s.	24	nw.	19	20	7	4	2.6	.0	.0
Brownsville	57	88	96	29.90	29.95	.....	76.8	+1.9	93	4	85	57	23	69	24	69	66	79	.93	−2.4	6	9.7	se.	28	n.	19	18	9	4	3.8	.0	.0
Corpus Christi	20	11	78	29.95	29.97	−.03	75.5	+2.3	94	2	83	54	23	68	28	67	64	75	2.04	−.4	6	10.6	s.	27	n.	19	23	3	5	2.5	.0	.0
Dallas	512	220	227	29.65	30.01	.....	66.8	.....	94	5	77	37	23	57	32	56	49	60	4.08	+1.4	6	11.4	n.	37	nw.	18	18	5	8	3.5	.0	.0
Fort Worth	679	92	110	29.30	30.01	−.02	67.4	+.7	97	5	78	37	23	56	33	.....	.....	.....	3.55	+.7	6	8.7	n.	32	n.	18	20	3	8	3.1	.0	.0
Galveston	54	106	114	29.94	30.00	−.03	72.5	−.2	86	7	78	48	23	67	18	66	63	77	2.95	−1.4	7	10.0	s.	30	s.	17	22	6	3	2.5	.0	.0
Houston	138	292	314	29.86	30.01	.....	71.6	+1.3	94	4	81	42	23	62	24	.....	.....	.....	6.82	+3.1	7	11.1	s.	35	nw.	19	20	6	5	3.1	.0	.0
Palestine	510	64	72	29.50	30.03	.00	67.4	+.2	91	6	77	34	23	58	30	58	52	65	1.86	−1.5	4	7.2	s.	23	nw.	19	18	8	5	3.4	.0	.0
Port Arthur	34	98	106	29.96	30.00	.....	70.0	.....	87	4	78	40	23	62	25	64	60	78	4.65	+1.3	7	10.2	s.	34	nw.	19	18	8	5	3.4	.0	.0
San Antonio	693	242	301	29.28	29.99	−.02	72.6	+2.1	99	7	84	48	23	61	32	62	56	63	3.09	+.9	3	10.7	ne.	32	nw.	17	19	7	5	3.1	.0	.0

[1] Observations taken at airport.

TABLE 2.—*Climatological data for Weather Bureau stations, October 1937*—Continued

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
							54.8	−3.0										72	4.71	+2.1										6.1		
Chattanooga	762	71	214	29.24	30.06	−.03	59.4	−2.5	88	30	69	29	24	50	40	52	47	70	5.71	+2.7	11	7.4	ne.	29	w.	19	14	5	12	5.5	0.0	0.0
Knoxville	995	66	84	29.00	30.06	−.03	57.0	−2.9	86	6	66	29	24	48	38	50	46	75	4.08	+1.5	11	5.8	ne.	21	w.	19	11	7	13	5.7	T	.0
Memphis	399	78	86	29.61	30.03	−.04	60.8	−2.5	87	30	68	32	23	53	26	54	48	68	5.49	+2.8	12	7.8	e.	24	sw.	19	18	3	10	4.2	.0	.0
Nashville	546	168	188	29.48	30.07	−.01	58.0	−3.0	87	6	67	29	24	49	38	51	46	71	4.31	+1.8	10	9.2	sw.	35	se.	18	9	8	14	5.9	.0	.0
Lexington	989	6					53.9	−3.5	87	6	64	27	15	43	35				3.96	+1.4	13						9	10	12		T	.0
Louisville	525	188	234	29.48	30.06	−.02	56.0	−3.3	87	1	64	31	24	48	31	49	44	70	4.48	+1.8	14	10.9	s.	37	sw.	19	10	7	14	6.0	1.2	.0
Evansville	431	76	116	29.57	30.05	−.03	56.8	−2.6	89	1	66	32	23	48	34	49	44	68	5.57	+2.8	10	9.0	sw.	36	sw.	19	9	8	14	5.6	.0	.0
Indianapolis	822	194	230	29.16	30.05	−.02	53.0	−2.7	86	1	61	29	24	45	32	46	41	69	5.59	+2.8	12	10.5	nw.	34	s.	19	5	13	13	6.5	T	.0
Terre Haute	575	63	149	29.40	30.03		54.2		88	1	63	28	15	45	39	47	42	71	6.22	+3.5	12	9.8	sw.	34	sw.	19	11	9	11	5.6	T	.0
Cincinnati	627	11	51	29.37	30.06	−.02	53.7	−2.0	86	1	63	29	15	45	32	47	42	73	3.03	+.5	14	7.7	sw.	30	sw.	19	9	7	15	6.2	T	.0
Columbus	822	90	210	29.17	30.05	−.03	52.6	−2.6	85	1	61	31	24	44	32	46	41	71	2.41	.0	10	10.4	s.	43	sw.	19	7	11	13	6.1	T	.0
Dayton	899	60	163	29.06	30.02		52.9	−2.1	85	1	61	30	24	45	33				4.06	+1.5	13	8.7	sw.	36	sw.	19	6	14	11	6.0	T	.0
Elkins	1,947	65	83	28.02	30.10	.00	48.8	−3.5	82	2	58	22	25	39	38	44	40	80	8.31	+5.4	18	6.4	se.	22	se.	18	4	9	18	7.4	1.7	.0
Parkersburg	637	77	84	29.36	30.05	−.03	53.5	−2.6	86	6	62	28	15	45	32	47	43	75	3.67	+1.2	16	6.9	se.	21	nw.	27	8	6	17	6.8	.2	.0
Pittsburgh [1]	1,273	39	54	28.68	30.04	−.04	50.1	−5.6	85	6	58	27	16	42	32	45	41	78	3.73	+1.2	14	11.3	nw.	33	sw.	20	3	6	22	7.6	T	.0
Lower Lake Region							49.4	−2.7										75	3.88	+1.0										7.4		
Buffalo	768	243	280	29.17	30.00	−.05	48.1	−3.8	76	4	54	29	15	42	25	44	40	77	3.55	+.3	13	16.2	s.	52	sw.	20	3	11	17	7.3	.8	.0
Canton	448	10	61	29.50	29.99		46.2	−1.0	82	6	55	23	14	37	29	42	39	80	3.10	+.1	17	8.6	sw.	29	w.	24	1	11	19	8.0	T	.0
Ithaca	836	77	100	29.11	30.02		48.6	−2.5	82	6	57	25	17	40	30	43	39	75	5.17	+2.2	17	10.3	nw.	31	nw.	30	2	7	22	8.2	.6	.0
Oswego	335	71	85	29.63	30.00	−.05	49.5	−1.7	86	6	56	29	17	43	26	44	39	72	6.35	+3.1	19	10.8	s.	27	nw.	30	2	4	25	8.3	.8	.0
Rochester	523	86	102	29.44	30.02	−.03	49.0	−2.5	85	6	56	31	14	42	27	44	39	73	4.21	+1.6	15	8.9	sw.	34	sw.	12	3	5	23	7.9	.2	.0
Syracuse	596	65	79	29.37	30.01	−.05	50.4	−1.2	86	6	58	29	17	43	28				6.83	+4.0	21	8.0	s.	24	nw.	30	3	8	20	7.8	T	.0
Erie	714	130	166	29.24	30.01	−.04	49.8	−3.6	79	1	56	32	24	44	23	45	41	74	3.75	+.1	15	15.1	s.	40	s.	18	4	12	15	6.8	2.8	.0
Cleveland	762	267	318	29.19	30.02	−.04	50.8	−2.8	83	1	57	31	24	44	27	45	40	71	3.36	+.6	12	17.3	nw.	43	w.	19	4	7	20	7.4	1.0	.0
Sandusky	629	5	67	29.33	30.02	−.04	51.4	−2.9	87	1	60	30	24	43	33				3.29	+.8	9	9.8	sw.	30	sw.	19	4	12	15	7.0	.1	.0
Toledo	628	79	87	29.35	30.04	−.01	50.1	−3.3	86	1	58	30	24	42	35	45	40	73	2.34	.0	5	9.7	w.	30	w.	19	6	13	12	6.4	T	.0
Fort Wayne	857	69	84	29.11	30.04		50.4	−3.1	85	1	58	28	23	43	34	45	41	76	2.30	−.3	10	9.1	nw.	37	sw.	19	4	12	15	6.8	.4	.0
Detroit [1]	730	218	258	29.33	30.02	−.03	48.8	−3.7	85	1	57	27	14	41	29	44	39	75	2.35	.0	8	10.5	nw.	36	sw.	19	2	8	21	7.7	T	.0
Upper Lake Region							45.8	−2.7										77	2.61	−0.1										7.2		
Alpena	609	13	89	29.32	29.99	−.04	44.1	−3.0	69	5	50	25	14	38	27	41	38	81	1.82	−.9	18	11.3	nw.	38	s.	20	2	10	19	7.7	.3	.0
Escanaba	612	41	49	29.32	29.98	−.03	43.4	−2.6	75	29	51	23	13	36	36	39	36	79	2.30	−.3	10	8.1	nw.	23	nw.	20	4	9	18	7.5	T	.0
Grand Rapids	707	70	244	29.24	30.02	−.02	49.0	−2.2	79	1	56	28	23	42	24	44	40	76	2.95	+.1	11	10.9	n.	53	sw.	19	4	11	16	7.1	T	.0
Lansing	878	5	90	29.06	30.02		46.7	−3.6	78	1	55	25	14	38	34	43	40	83	1.66	−.8	10	8.6	nw.	30	sw.	19	7	8	16	6.7	T	.0
Ludington	637	5	54	29.30	30.00		47.0	−2.7	70	5	54	27	14	40	23	43	39		3.55	+.6	13		e.				6	13	12		7.9	.0
Marquette	734	44	69	29.17	29.98	−.03	43.4	−3.3	73	29	50	28	23	37	32	39	36	80	4.42	+1.7	16	8.4	nw.	24	nw.	20	4	5	22	8.0	4.5	.0
Sault Sainte Marie	614	11	52	29.29	30.00	−.01	43.2	−1.4	65	4	49	27	14	37	24	39	36	80	3.33	−.4	15	9.1	se.	35	nw.	30	3	9	19	7.6	.9	.0
Chicago	673	7	131	29.30	30.03	−.01	51.2	−2.8	84	1	58	30	23	45	31	45	40	70	3.09	+.6	11	10.4	nw.	29	sw.	19	10	6	15	6.2	T	.0
Green Bay	617	109	141	29.32	30.00	−.02	45.8	−2.7	77	29	53	26	13	38	36	41	36	74	2.30	−.2	11	10.2	nw.	30	w.	20	3	11	17	7.1	T	.0
Milwaukee	681	97	221	29.27	30.01	−.02	48.8	−2.3	81	29	56	26	14	42	37	43	38	70	1.83	−.5	8	12.3	w.	40	w.	19	8	6	17	6.8	T	.0
Duluth	1,133	5	47	28.76	30.00	.00	41.2	−2.9	74	29	48	18	23	34	32	37	33	79	1.50	−.8	8	11.4	nw.	43	nw.	20	6	5	20	7.2	T	.0
North Dakota							44.7	+0.9										69	0.64	−0.5										5.7		
Moorhead, Minn	940	50	58	28.99	30.02	+.02	44.1	−.4	86	3	54	16	14	34	40	38	32	68	.11	−1.6	2	9.7	s.	24	w.	5	5	12	14	7.0	T	.0
Bismark	1,674	8	57	28.22	30.02	+.03	46.2	+1.3	86	3	57	15	14	35	43	39	32	64	.49	−.4	3	9.4	nw.	30	nw.	18	11	12	8	5.2	T	.0
Devils Lake	1,478	11	44	28.42	30.02	+.03	42.6	+.2	83	3	52	16	14	33	38	37	33	75	.37	−.9	6	9.8	nw.	25	nw.	5	7	10	14	6.2	T	.0
Grand Forks	833	12	67																													
Williston	1,878	42	50	28.02	30.02	+.04	45.9	+2.5	80	28	55	22	13	36	36	39	34	68	1.61	+.8	5	9.2	se.	32	nw.	18	13	9	9	4.9	T	.0
Upper Mississippi Valley							51.6	−1.7										70	2.64	+0.2										5.7		
Minneapolis-St. Paul Minn.	919	105	208	29.02	30.01	.00	46.7	−2.2	80	3	54	24	14	39	25	41	34	65	1.36	−.7	9	11.1	nw.	30	w.	5	10	8	13	5.7	T	.0
La Crosse	714	11	48	29.25	30.03	+.01	47.8	−2.5	81	29	56	24	14	39	38	42	38	77	3.51	+1.2	9	5.7	nw.	16	n.	19	10	10	11	5.5	T	.0
Madison	974	70	78	28.95	30.01	−.02	47.8	−2.5	82	29	55	27	23	40	36	43	38	72	2.85	+.4	8	8.3	se.	26	nw.	19	9	7	15	6.3	T	.0
Charles City	1,015	10	51	28.94	30.05	+.03	47.2	−1.4	84	29	57	19	23	37	43	41	37	76	2.24	+.1	10	6.2	nw.	17	se.	31	11	9	11	5.2	.4	.0
Davenport	606	66	161	29.37	30.03	−.01	52.0	−1.7	87	1	61	26	14	43	35	45	40	70	2.51	+.1	7	9.2	nw.	30	nw.	20	9	9	13	6.0	T	.0
Des Moines	861	5	99	29.23	30.04	+.01	52.2	−1.2	89	29	63	21	23	42	38	45	39	68	1.38	−1.1	8	9.0	nw.	25	nw.	19	15	5	11	4.7	.2	.0
Dubuque	699	60	79	29.27	30.03	−.01	49.8	−2.1	85	29	59	25	15	41	42	45	38	71	3.32	+.8	11	5.8	nw.	19	nw.	20	9	9	13	6.0	.3	.0
Keokuk	614	64	78	29.38	30.04	−.01	54.0	−1.4	89	5	63	27	14	45	36	45	38	63	1.08	−1.2	5	7.5	sw.	24	w.	19	13	6	12	5.3	T	.0
Cairo	358	87	93	29.65	30.04	−.03	57.8	−2.6	87	6	67	31	24	49	32	51	47	73	4.47	+1.7	10	8.6	sw.	28	w.	19	11	10	10	5.6	.0	.0
Peoria	609	11	45	29.38	30.04	−.01	52.2	+.2	89	1	62	23	15	42	37	45	40	73	2.69	+.4	9	6.0	nw.	21	w.	19	12	6	13	5.3	T	.0
Springfield, Ill	636	5	191	29.35	30.03	−.02	54.4	−1.4	88	1	63	29	14	46	36	46	41	68	2.81	+.3	11	10.8	nw.	35	nw.	19	10	6	15	5.5	T	.0
St. Louis	568	179	303	29.42	30.03	−.03	57.0	−1.8	89	1	66	32	14	48	36	48	41	61	3.51	+.8	8	11.1	w.	33	w.	19	13	7	11	4.7	T	.0
Missouri Valley							53.7	−0.3										62	1.39	−0.8										4.4		
Columbia, Mo	784	6	66	29.19	30.03	−.02	56.2	−.4	94	5	67	24	23	46	38				1.64	−1.0	8	7.6	n.	25	nw.	19	12	8	11	5.1	.0	.0
Kansas City [1]	750	32	45	29.22	30.03	−.01	57.0	−.7	90	2	68	24	23	46	39	48	41	62	1.15	−1.8	8	8.5	sw.	34	nw.	19	14	8	9	4.7	T	.0
St. Joseph	967	11	49	29.00	30.04		56.2		89	1	67	24	23	46	33	47	39	61	1.26	−1.6	9	8.1	sw.	32	nw.	19	16	8	7	3.9	T	.0
Springfield, Mo	1,324	98	104	28.63	30.04	−.01	57.6	−.6	90	5	67	24	23	48	34	48	42	64	1.75	−1.3	8	9.1	s.	31	w.	19	15	5	11	4.6	.0	.0
Topeka	987	65	87	28.97	30.03		57.3	+.3	90	1	69	25	23	46	38	48	40	60	1.40	−1.0	7	8.7	w.	28	nw.	19	16	10	5	4.9	T	.0
Lincoln	1,189	11	81	28.76	30.03	.00	54.0	−.2	87	29	65	27	14	43	36	46	39	63	2.29	+.4	7	9.0	n.	37	w.	19	15	8	8	4.5	.0	.0
Omaha [1]	982	31	44	28.98	30.04	+.01	52.8	−1.5	90	29	64	22	14	42	44	45	38	65	1.43	−.7	7	9.3	se.	35	nw.	19	13	10	8	4.6	T	.0
Valentine	2,598	47	54	27.33	30.06	+.05	49.8	+.5	86	29	62	24	22	37	44	40	32	58	.76	−.3	4	9.2	w.	31	s.	3	13	11	7	4.2	T	.0
Sioux City	1,138	64	106	28.81	30.04	+.02	50.3	−.6	84	28	60	20	14	41	43	43	36	63	1.87	+.1	9	8.5	nw.	34	nw.	26	14	8	9	4.6	1.4	.0
Huron	1,307	59	74	28.63	30.05	+.04	48.1	+.4	86	3	60	13	14	36	46	40	32	60	.35	−.9	6	9.7	se.	31	nw.	5	16	7	8	3.8	T	.0

[1] Observations taken at airport.

TABLE 2.—*Climatological data for Weather Bureau stations, October 1937*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*							*0–10*	*In.*	*In.*
Northern Slope							**49.6**	**+4.5**										**62**	**0.78**	**−0.3**									**4.8**		
Missoula	3,263	80	91				51.8	+7.0	75	28	64	33	19	40	37				.68	−.5	6	5.7	se.	31	e.	12	12	7	12	5.2	.0	.0
Havre	2,507	11	67	27.37	30.02	+.04	49.2	+4.7	82	28	61	25	15	37	41	42	35	64	.50	−.2	4	9.1	w.	30	sw.	28	7	13	11	5.8	.0	.0
Helena	4,124	85	111	25.86	30.05	+.02	50.0	+5.1	76	28	60	34	7	40	34	42	35	61	.38	−.5	5	7.6	sw.	28	w.	19	10	10	11	5.9	T	.0
Kalispell	2,973	48	56	27.00	30.07	+.06	47.4	+3.9	70	28	57	31	18	38	31	43	39	77	.87	−.2	10	4.6	w.	21	sw.	28	6	6	19	7.1	.0	.0
Miles City	2,371	48	55	27.49	29.99	−.01	51.2	+4.7	82	2	63	29	15	40	37	43	35	60	1.00	+.1	6	7.1	s.	25	se.	30	10	14	7	4.8	T	.0
Rapid City	3,259	50	58	26.65	30.03	+.02	51.2	+2.7	88	3	63	26	14	39	45	42	34	60	.14	−.8	5	8.6	w.	27	nw.	18	17	6	8	4.2	.1	.0
Cheyenne [1]	6,144	5	39	24.00	30.02	+.01	48.7	+3.9	76	28	62	28	13	36	41	40	32	61	1.23	+.3	7	11.1	nw.	38	w.	4	15	7	9	4.4	2.8	.0
Lander	5,372	60	68	24.70	30.06	+.02	48.8	+5.3	78	2	64	27	7	34	41	39	29	53	.99	−.4	8	4.9	sw.	30	n.	17	19	9	3	3.0	.5	.0
Sheridan	3,790	10	47	26.14	30.05	-----	49.2	-----	86	3	64	26	15	34	49	40	33	65	.95	−.1	7	5.2	nw.	22	nw.	31	18	7	6	3.9	T	.0
Yellowstone Park	6,241	12	46	23.96	30.14	+.12	45.4	+5.7	68	2	58	23	19	32	38	36	29	60	.52	−.7	6	7.2	sw.	29	sw.	28	15	10	6	4.0	.3	T
North Platte	2,821	11	51	27.11	30.05	+.03	52.0	+2.3	88	4	65	28	22	38	46	43	36	64	1.27	+.2	5	7.4	w.	26	n.	21	16	7	8	4.0	T	.0
Middle Slope							**57.0**	**+1.1**										**57**	**1.14**	**−0.6**									**3.8**		
Denver	5,292	106	113	24.78	30.02	+.01	53.8	+2.6	81	2	66	32	18	42	37	42	30	46	.55	−.5	4	6.9	s.	32	n.	18	16	7	8	4.2	.8	.0
Pueblo	4,685	80	86	25.34	30.01	+.02	55.0	+3.0	85	3	70	31	19	40	47	43	32	48	.48	−.2	3	6.6	nw.	27	w.	20	18	8	5	3.4	.0	.0
Concordia	1,392	50	58	28.56	30.04	+.01	55.8	−.1	87	29	67	29	22	44	39	46	39	63	1.58	−.4	5	8.4	se.	25	nw.	19	15	9	7	4.2	.0	.0
Dodge City	2,509	10	86	27.42	30.02	.00	57.0	+.9	94	4	70	34	13	44	42	46	39	61	.87	−.4	5	11.6	s.	37	n.	18	17	7	7	3.4	.0	.0
Wichita	1,358	85	93	28.60	30.03	.00	58.4	−.2	87	4	69	32	22	48	38	49	41	59	1.12	−1.5	4	9.4	se.	26	n.	6	16	9	6	3.7	.0	.0
Oklahoma City	1,214	10	47	28.74	30.02	−.01	62.1	+.6	95	5	73	34	23	51	34	52	46	64	2.25	−.6	7	8.6	s.	25	nw.	18	18	3	10	3.9	.0	.0
Southern Slope							**65.9**	**+2.8**										**55**	**1.28**	**−0.6**									**3.2**		
Abilene	1,738	10	52	28.20	30.00	−.01	67.2	+1.8	99	5	80	41	23	55	38	54	46	57	2.70	+.2	5	8.9	s.	27	n.	18	19	3	9	3.5	.0	.0
Amarillo	3,676	10	49	26.30	30.00	.00	61.8	+4.1	90	4	75	36	19	48	41	48	38	52	.31	−1.4	5	8.9	s.	31	nw.	18	17	6	8	3.9	.0	.0
Del Rio	960	63	71	28.96	29.94	−.04	72.6	+2.6	97	4	84	50	20	61	35	60	52	56	1.49	−.3	7	8.1	se.	21	w.	13	22	2	7	2.7	.0	.0
Roswell	3,566	75	85	26.41	29.99	+.03	62.1	+2.6	91	5	76	36	20	48	46	50	41	54	.63	−.8	6	7.3	s.	30	nw.	18	20	7	4	2.7	.0	.0
Southern Plateau							**65.8**	**+2.9**										**46**	**0.63**	**−0.1**									**2.2**		
El Paso	3,778	82	101	26.21	29.95	+.03	66.8	+3.3	91	8	79	44	20	55	37	53	41	47	1.71	+.9	5	7.3	e.	23	e.	9	24	1	6	2.4	.0	.0
Albuquerque [1]	4,972	5	39	25.10	29.97	-----	58.0	+1.4	83	3	73	34	20	43	40	46	36	54	.79	.0	3	7.4	n.	38	nw.	18	21	7	3	2.5	.0	.0
Santa Fe	7,013	38	53	23.32	30.00	+.04	52.6	+2.2	73	3	65	32	20	40	32	42	31	51	.65	−.5	3	5.5	e.	19	s.	9	18	7	6	3.2	.0	.0
Flagstaff	6,907	10	59	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phoenix	1,107	39	51	28.72	29.86	−.02	74.8	+4.2	100	2	91	50	20	59	42	57	44	38	T	−.5	0	5.1	e.	15	w.	15	26	2	3	1.6	.0	.0
Yuma	141	9	54	29.71	29.85	−.02	76.8	+3.5	100	10	93	53	5	61	39	60	47	42	.00	−.3	0	4.2	w.	19	n.	8	25	6	0	1.2	.0	.0
Independence	3,957	5	26	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Middle Plateau							**53.4**	**+2.9**										**46**	**0.40**	**−0.3**									**2.5**		
Reno	4,527	61	76	25.52	30.04	+.05	54.2	+3.4	80	24	70	31	7	38	42	43	31	48	.20	−.2	2	5.4	sw.	27	nw.	2	25	4	2	2.0	.0	.0
Tonopah	6,060	12	20	-----	-----	-----	55.7	-----	74	25	65	33	4	46	26	41	26	35	.01	-----	1	-----	se.	-----	-----	-----	-----	-----	-----	-----	-----	-----
Winnemucca	4,344	18	56	25.68	30.07	+.02	50.9	+2.6	80	12	71	20	6	31	52	39	27	46	.38	−.2	4	7.4	ne.	30	s.	13	21	6	4	2.7	.0	.0
Modena	5,473	10	43	24.67	30.00	+.04	51.2	+3.2	78	24	69	23	19	33	46	39	25	42	.06	−.7	1	9.0	w.	32	sw.	3	23	7	1	1.9	T	.0
Salt Lake City [1]	4,360	163	203	25.79	30.04	+.03	54.4	+1.9	82	2	68	29	19	41	38	45	38	59	2.24	-----	9	8.4	se.	31	nw.	3	19	7	5	3.0	.0	.0
Grand Junction	4,602	60	68	25.44	30.01	+.02	56.4	+3.6	81	2	70	32	19	43	34	45	34	48	.94	.0	4	6.1	se.	23	s.	3	20	8	3	2.8	.0	.0
Northern Plateau							**54.8**	**+5.1**										**60**	**0.85**	**−0.2**									**4.4**		
Baker	3,471	36	54	26.52	30.11	+.03	52.1	+5.5	79	12	66	31	7	38	42	44	38	65	1.30	+.4	7	5.8	se.	19	s.	1	13	7	11	4.3	.0	.0
Boise	2,739	79	87	27.22	30.09	+.03	55.2	+4.1	78	12	68	32	5	43	35	46	38	58	1.18	−.1	5	4.5	se.	18	nw.	2	20	3	8	3.3	.0	.0
Pocatello	4,477	60	68	25.53	30.04	.00	54.0	+5.6	78	2	67	27	7	41	38	42	31	49	.87	−.3	4	8.8	se.	30	sw.	17	23	4	4	2.5	.0	.0
Spokane	1,929	101	110	28.01	30.07	+.01	52.6	+4.3	72	13	62	34	7	43	34	47	41	69	.87	−.3	9	5.6	s.	21	s.	28	10	9	12	5.8	.0	.0
Walla Walla	991	57	65	28.98	30.05	−.02	58.2	+4.7	77	25	68	42	19	48	30	51	44	61	.74	−.8	8	4.3	s.	15	s.	16	11	7	13	5.3	.0	.0
Yakima	1,076	58	67	28.90	30.05	-----	56.7	+6.5	77	10	69	33	31	44	34	49	41	59	.16	−.4	3	4.9	nw.	23	s.	28	10	12	9	5.1	.0	.0
North Pacific Coast Region							**57.1**	**+4.6**										**80**	**3.61**	**−0.2**									**6.2**		
North Head	211	11	56	29.80	30.03	−.02	57.2	+4.3	82	22	62	47	11	52	27	54	52	87	2.89	−2.1	15	13.1	se.	68	s.	27	8	8	15	6.2	.0	.0
Seattle	125	90	321	29.89	30.02	−.03	56.7	+5.3	73	22	64	43	5	50	23	53	50	80	1.87	−1.0	11	7.6	se.	36	s.	16	5	11	15	6.4	.0	.0
Tatoosh Island	86	10	54	29.91	30.00	−.01	53.6	+3.4	66	22	57	43	6	50	13	51	50	89	9.54	+1.4	14	14.9	e.	55	s.	27	6	8	17	6.8	.0	.0
Medford [1]	1,329	29	58	28.64	30.04	-----	56.0	-----	81	12	70	35	6	42	45	51	46	73	2.26	+.9	8	-----	s.	-----	-----	-----	11	10	10	5.1	.0	.0
Portland, Oreg	153	68	106	29.87	30.02	−.04	59.2	+5.0	79	12	68	44	18	51	28	55	51	77	2.91	−.2	10	5.3	nw.	18	s.	16	7	9	15	6.2	.0	.0
Roseburg	510	45	76	29.49	30.04	−.04	58.8	+4.9	84	9	70	39	6	47	42	54	50	76	2.17	−.4	12	3.3	nw.	16	sw.	2	4	12	15	6.8	.0	.0
Middle Pacific Coast Region							**62.7**	**+2.4**										**68**	**2.49**	**+0.9**									**3.7**		
Eureka	62	73	89	29.99	30.06	.00	56.8	+3.2	71	8	63	45	31	50	22	53	51	84	4.33	+2.0	11	5.2	sw.	18	se.	14	7	12	12	5.7	.0	.0
Redding [1]	722	20	34	-----	-----	-----	65.2	+.9	90	21	75	46	3	55	30	54	45	53	3.86	+1.8	8	7.5	nw.	20	n.	20	18	5	8	3.3	.0	.0
Sacramento	66	92	115	29.91	29.98	−.01	65.4	+2.5	89	22	79	48	5	52	36	56	48	59	.87	.0	4	5.5	n.	18	nw.	18	26	1	4	1.9	.0	.0
San Francisco	155	112	132	29.82	29.99	−.02	63.4	+2.9	87	21	71	50	11	56	27	57	53	78	.90	−.2	4	6.4	w.	22	w.	10	16	9	6	4.0	.0	.0
South Pacific Coast Region							**66.7**	**+2.4**										**67**	**0.04**	**−0.6**									**2.6**		
Fresno	327	97	105	29.62	29.97	+.01	67.9	+3.9	92	22	82	48	5	54	38	56	46	52	.11	−.5	2	5.2	nw.	17	w.	15	24	5	2	1.9	.0	.0
Los Angeles	338	159	191	29.59	29.95	.00	67.6	+2.3	92	8	77	52	28	58	32	58	53	69	.01	−.7	1	4.9	sw.	14	w.	8	22	6	3	2.5	.0	.0
San Diego	87	62	70	29.84	29.93	−.02	64.6	+.9	80	11	71	54	21	58	20	58	56	79	T	−.5	0	5.8	nw.	15	nw.	13	16	11	4	3.5	.0	.0
West Indies																															
San Juan, P. R.	82	9	54	29.83	29.91	-----	80.2	+.4	89	30	85	73	7	75	14	-----	-----	-----	5.98	+.1	17	8.8	e.	26	e.	14	14	14	3	4.2	.0	.0
Panama Canal																															
Balboa Heights	118	6	92	-----	[3]29.84	+.02	79.8	+.6	89	5	86	72	27	74	16	-----	-----	[3]87	9.13	−.9	19	4.4	nw.	21	s.	24	0	18	13	7.3	.0	.0
Cristobal	36	6	97	-----	[3]29.84	+.02	81.4	+1.6	90	9	87	74	31	76	16	76	75	[3]85	16.58	+1.1	28	5.7	s.	24	sw.	25	0	7	24	8.3	.0	.0
Alaska																															
Fairbanks	454	11	87	[3]29.17	[3]29.70	-----	30.7	−.6	54	4	39	4	30	23	28	30	27	81	1.39	+.7	9	3.8	ne.	15	ne.	10	9	11	11	5.5	4.3	T
Juneau	80	96	116	[3]29.69	[3]29.78	-----	47.4	+4.2	62	22	52	34	3	43	19	45	41	81	14.80	+3.9	25	7.7	s.	33	se.	22	2	3	26	8.8	.0	.0
Nome	22	5	32	[3]29.67	[3]29.69	-----	33.5	+4.9	58	12	40	16	31	26	22	32	28	73	1.00	−.4	6	7.8	n.	26	ne.	29	11	8	12	5.5	.7	T
Hawaiian Islands																															
Honolulu	38	86	100	[3]29.96	[3]30.00	-----	77.6	+.8	84	30	82	70	18	73	11	71	68	74	1.45	−.1	14	8.0	e.	23	e.	5	11	15	5	4.9	.0	.0

[1] Observations taken at airport.

[3] Observations taken bihourly.

[2] Pressure not reduced to mean of 24 hours.

TABLE 3.—*Data furnished by the Canadian Meteorological Service, October 1937*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max.+ mean min.÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99				46.8	+1.0	52.8	40.7	59	24	5.37	+2.02	0.0
Sydney, Cape Breton Island	48	29.93	29.98	+0.03	49.0	+1.2	56.7	41.4	71	32	4.94	+.39	T
Halifax, Nova Scotia	88	29.69	30.04	+.02	49.1	+.4	54.9	43.3	66	31	6.47	+1.25	.0
Yarmouth, Nova Scotia	65	29.93	30.04	+.01	49.4	+.6	56.1	42.7	68	30	3.82	−.31	.0
Charlottetown, Prince Edward Island	38	29.93	30.01	+.03	48.1	+.3	54.4	41.9	67	30	5.30	+2.00	2.0
Chatham, New Brunswick	28	29.87	29.97	−.02	44.8	−.5	53.7	36.0	74	23	3.46	−.52	.0
Father Point, Quebec	20	29.90	29.92	−.04	43.2	+2.8	49.6	36.9	71	28	4.38	+1.11	.0
Quebec, Quebec	296	29.59	29.97	−.04	44.8	+1.3	50.7	38.9	71	28	7.54	+4.07	T
Doucet, Quebec	1,236	28.60	29.96	−.07	37.1	−.9	44.7	29.5	64	15	4.27	+.51	1.3
Montreal, Quebec	187												
Ottawa, Ontario	236												
Kingston, Ontario	285	29.66	30.00	−.04	47.2	−1.2	53.3	41.2	73	27	4.71	+1.71	T
Toronto, Ontario	379	29.60	30.02	−.04	47.4	−1.0	53.8	41.2	78	28	2.75	+.32	.2
Cochrane, Ontario	930	28.88	29.92	−.09	36.3	−2.8	42.6	30.1	77	21	3.44	+.82	6.8
White River, Ontario	1,244	28.61	29.97	−.03	36.5	−1.6	44.3	28.7	74	6	2.66	+.09	4.7
London, Ontario	808	29.14	30.01	−.05	45.4	−2.8	53.0	37.8	77	23	4.00	+1.18	3.2
Southampton, Ontario	656	29.28	29.98	−.05	44.7	−3.3	51.1	38.4	70	26	4.05	+.85	2.5
Parry Sound, Ontario	688	29.30	29.96	−.03	44.1	−2.1	50.3	37.8	71	25	3.33	−.67	5.2
Port Arthur, Ontario	644	29.27	29.99	−.01	38.7	−3.1	45.7	31.7	68	15	2.65	+.20	T
Winnipeg, Manitoba	760	29.14	30.00	−.01	40.9	−.2	49.0	32.9	70	20	.71	−.77	T
Minnedosa, Manitoba	1,690	28.16	30.02	+.03	39.4	−.8	48.1	30.6	72	11	2.00	+.90	T
Le Pas, Manitoba	860	29.02	30.01	+.08	37.2	+3.1	44.2	30.1	60	17	1.19	+.09	3.3
Qu'Appelle, Saskatchewan	2,115	27.69	30.00	.00	41.0	+.8	49.7	32.4	74	19	.69	−.44	T
Moose Jaw, Saskatchewan	1,759	28.00	30.04	+.07	44.2	+3.0	54.4	34.1	82	16	.16	−.65	T
Swift Current, Saskatchewan	2,392	27.42	30.00	.00	46.0	+4.0	55.8	36.2	79	17	.78	−.02	.3
Medicine Hat, Alberta	2,365	27.48	30.00	+.03	48.8	+3.5	59.1	38.8	80	23	.32	−.27	.0
Calgary, Alberta	3,540												
Banff, Alberta	4,521												
Prince Albert, Saskatchewan	1,450	28.44	30.01	+.03	39.7	+1.1	47.9	31.6	70	20	2.03	+1.18	2.0
Battleford, Saskatchewan	1,592	28.22	29.98	.00	41.8	+1.8	53.3	30.4	74	18	1.92	+1.33	.2
Edmonton, Alberta	2,150	27.66	29.98	+.06	43.3	+2.5	52.3	34.3	76	22	.63	−.08	.6
Kamloops, British Columbia	1,262	28.73	30.09	+.06	50.6	+3.0	60.6	40.7	70	30	.45	−.20	.0
Victoria, British Columbia	230	29.78	30.03	−.01	53.8	+3.4	60.1	47.4	68	42	3.11	+.39	.0
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20	29.97	29.99	.00	52.3	+2.5	57.9	46.7	67	38	14.16	+2.76	.0
Prince Rupert, British Columbia	170	29.68	29.86	−.03	51.4	+4.2	57.9	44.9	71	34	10.87	−1.45	.0
St. George's, Bermuda	158		30.04	+.02	75.8	+2.2	81.0	70.5	87	66	2.26	−4.05	.0
LATE REPORTS FOR SEPTEMBER 1937													
Cape Race, Newfoundland	99				56.8	+4.0	62.0	51.6	70	35	6.28	+2.69	0.0
Montreal, Quebec	187	29.82	30.04	+0.01	59.2	+.5	66.5	51.8	87	42	3.19	−.35	.0
Ottawa, Ontario	236	29.76	30.02	−.01	57.2	−.8	67.8	46.7	90	34	3.54	+.74	.0
Calgary, Alberta	3,540	26.42	30.08	+.12	52.8	+2.3	64.5	41.2	86	30	2.56	+1.03	5.0

TABLE 4.—*Severe local storms, October 1937*

(Compiled by Mary O. Souder from reports submitted by Weather Bureau officials)

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Cazenovia, N. Y.	6				$8,000	Thunderstorm	Barn, silo, and approximately 100 tons of hay and grain destroyed by fire.
Grandfield, Okla.	8	7 p. m.	300	0	58,000	Tornado	1 person injured; loss to crops, $8,000; property damage, $50,000.
San Francisco, Calif.	13					Electrical	This storm severe and unusual for this vicinity.
Mobile County, Ala.	17		40	0	1,200	Tornado	The storm passed through a pecan grove where 30 trees were uprooted or twisted off. It then visited a farm. The porch of the farmhouse was damaged, several small outbuildings destroyed, and a coop of chickens blown away. Path of tornado 2 miles long.
Kolin, La.	17	3 p. m.			15,000	Wind	1 person injured; damage to property, $10,000; loss to crops, $5,000.
Natchez, Miss.	17	4:20 p. m.	100		20,000	Tornadic winds	2 persons injured; property damaged; path 6 blocks long.
Garden Bottom, Ark., and vicinity.	18	11:30 p. m.	300	0	150,000	Tornado	The disturbance swept the extreme northeastern portion of Yell County, across the Arkansas River into Pope and Conway Counties. 2 persons injured; 2 stone buildings, a residence and 2 tenant houses demolished.
Elkhart County, Ind.	19	1 p. m.	400		12,000	Wind	Crop loss, $2,000; property damage, $10,000.
Rockingham, N. C., vicinity of.	19	3-4 p. m.	200		20,000	Wind and rain	Power lines and trees down; buildings destroyed; 2 persons injured; path from 10 to 12 miles long.
Detroit, Mich., and vicinity	19	4:30-5 p.m.				do	2 persons injured. Heavy rains deferred automobile driving. Number of trucks and passenger cars stalled on the highway; trees uprooted and poles down.
Huron and Erie Counties, Ohio.	19	P. m.			2,000	Wind	Small buildings wrecked; trees and wires down.
Rochester, Ind., vicinity of.	19					Wind and rain	2 large barns leveled; chimney and portions of roof blown off school building.
Menominee Beach Park, Mich.[1]	19				700	Wind	Damage to equipment and supplies being used in constructing a retaining wall.
Greenville County S. C. and vicinity.	19				25,000	Heavy rain	Small streams overflowed with damage to roads and bridges.
Grand Rapids, Holland, Zeeland, Whitehall, and Frankfort, Mich., and vicinities.	19-20	P. m.				Wind	Much damage to communication and power lines, trees, and buildings. At Grand Rapids a maximum wind velocity of 53 miles an hour occurred, this being the highest velocity ever recorded here. In Whitehall an 8-room house was blown off its foundation and an occupant injured.
Wisconsin	19-20			1	30,000	Wind and rain	Air traffic at standstill. Roads in northern section dangerous because of snow and ice. Trees uprooted; light and utility poles down; man seriously injured.
Buffalo, N. Y., and vicinity	24			1		Snow squall, thunder and lightning.	Automobile travel hazardous on highways covered with slush and snow, 6 inches deep in some places. Telephone lines damaged; several accidents occurred.
Mobile, Ala.	26		29	0	23,000	Tornado	Several buildings unroofed or damaged; 2 persons slightly injured; path 167 yards long.

[1] From press reports.

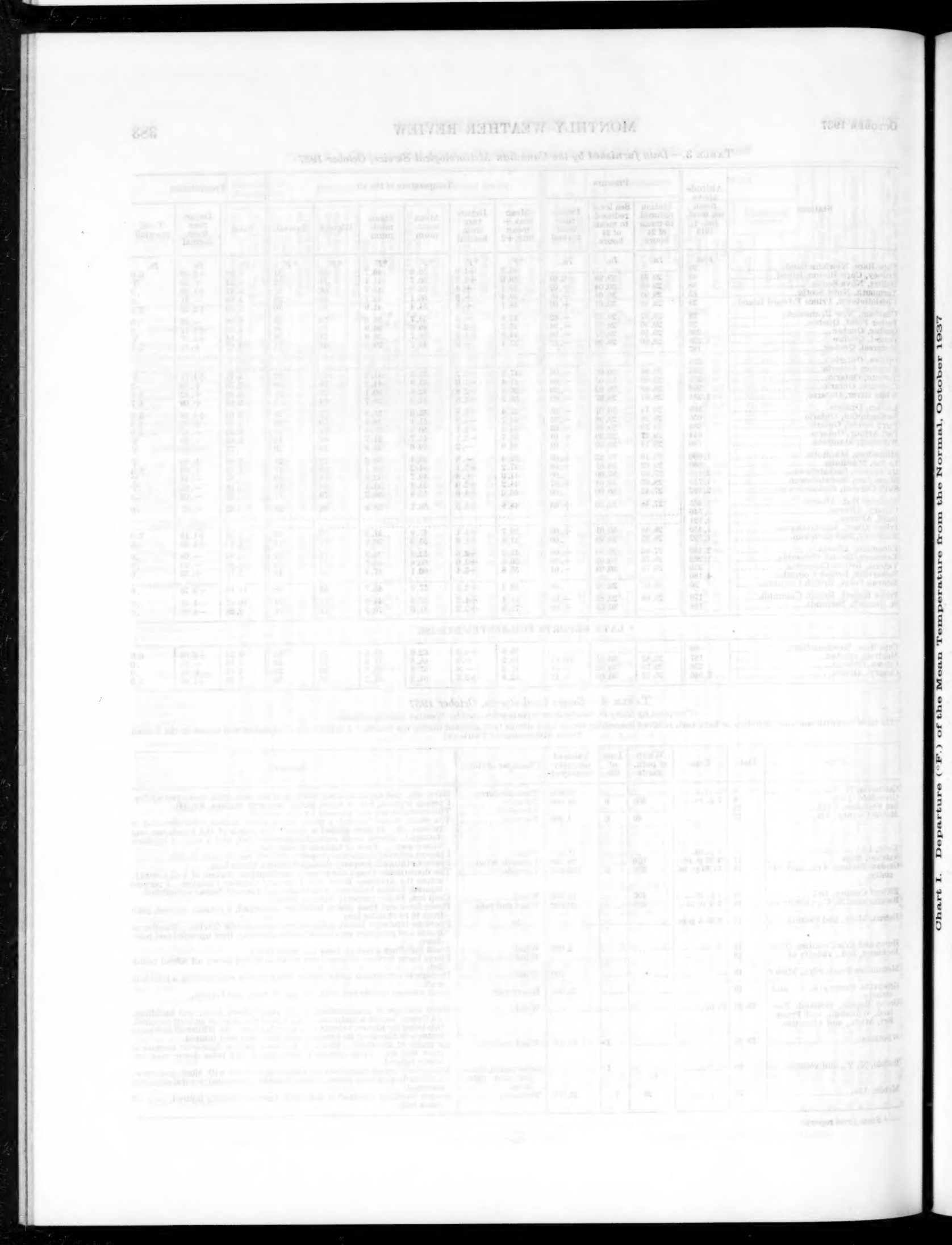


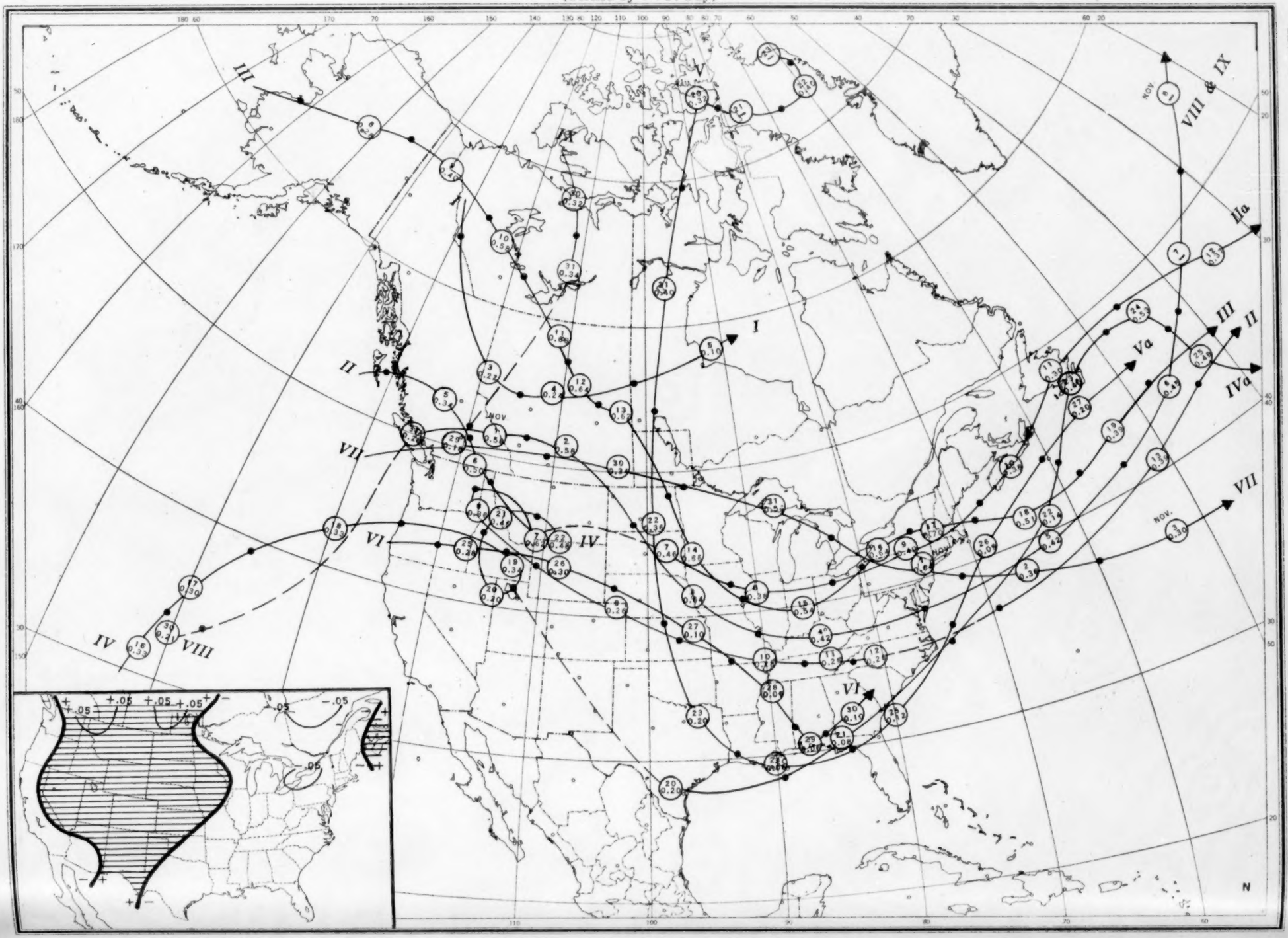
Chart I. Departure (°F.) of the Mean Temperature from the Normal, October 1937

Chart I. Departure (°F.) of the Mean Temperature from the Normal, October 1937

Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency
Statute Miles
Kilometers

Chart II. Tracks of Centers of Anticyclones, October 1937. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by W. P. Day)

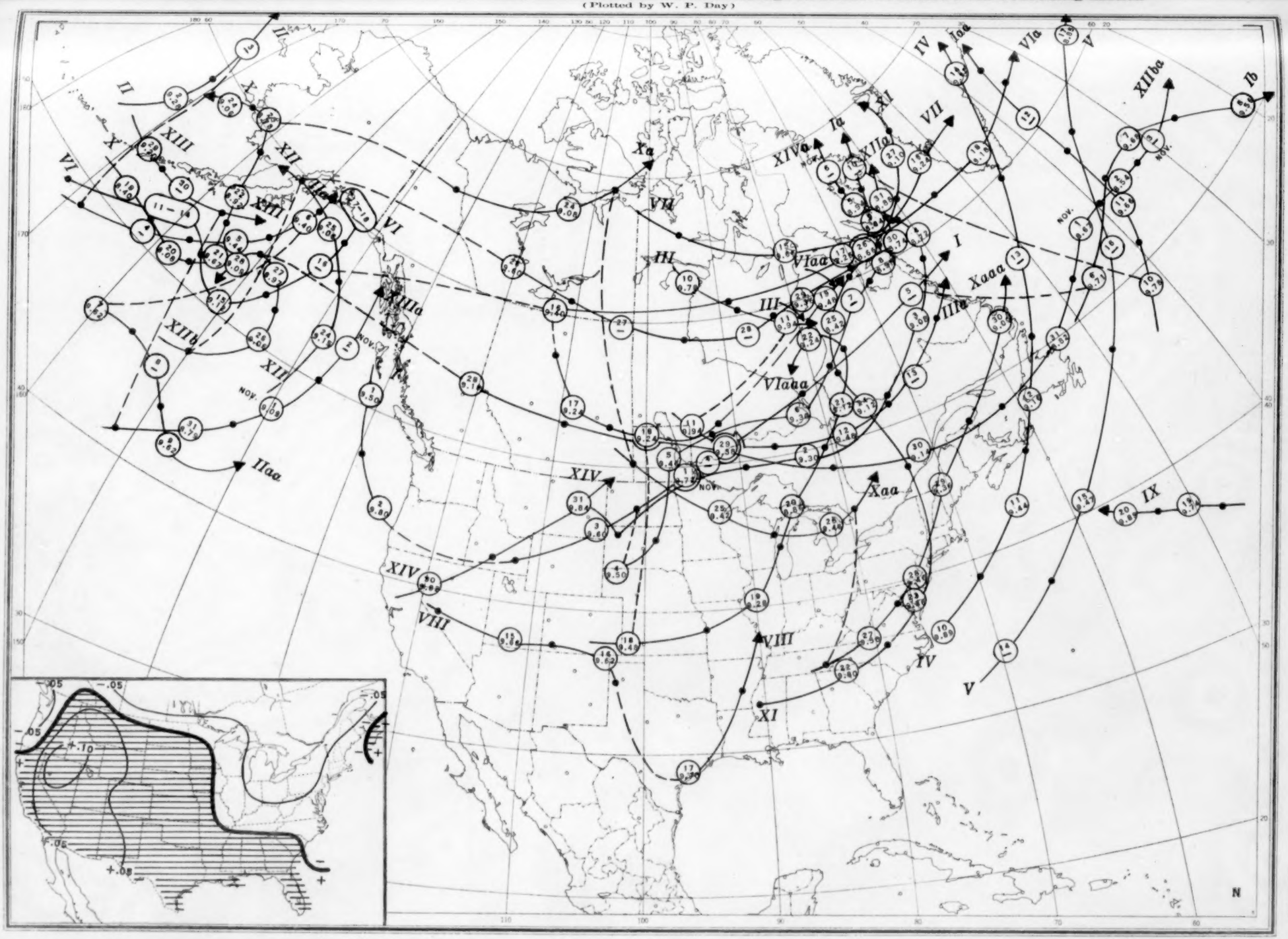


Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

(Plotted by W. P. Day)

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

(Plotted by W. P. Day)



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, October 1937

Chart V. Total Precipitation, Inches, October 1937. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, October 1937. (Inset) Departure of Precipitation from Normal

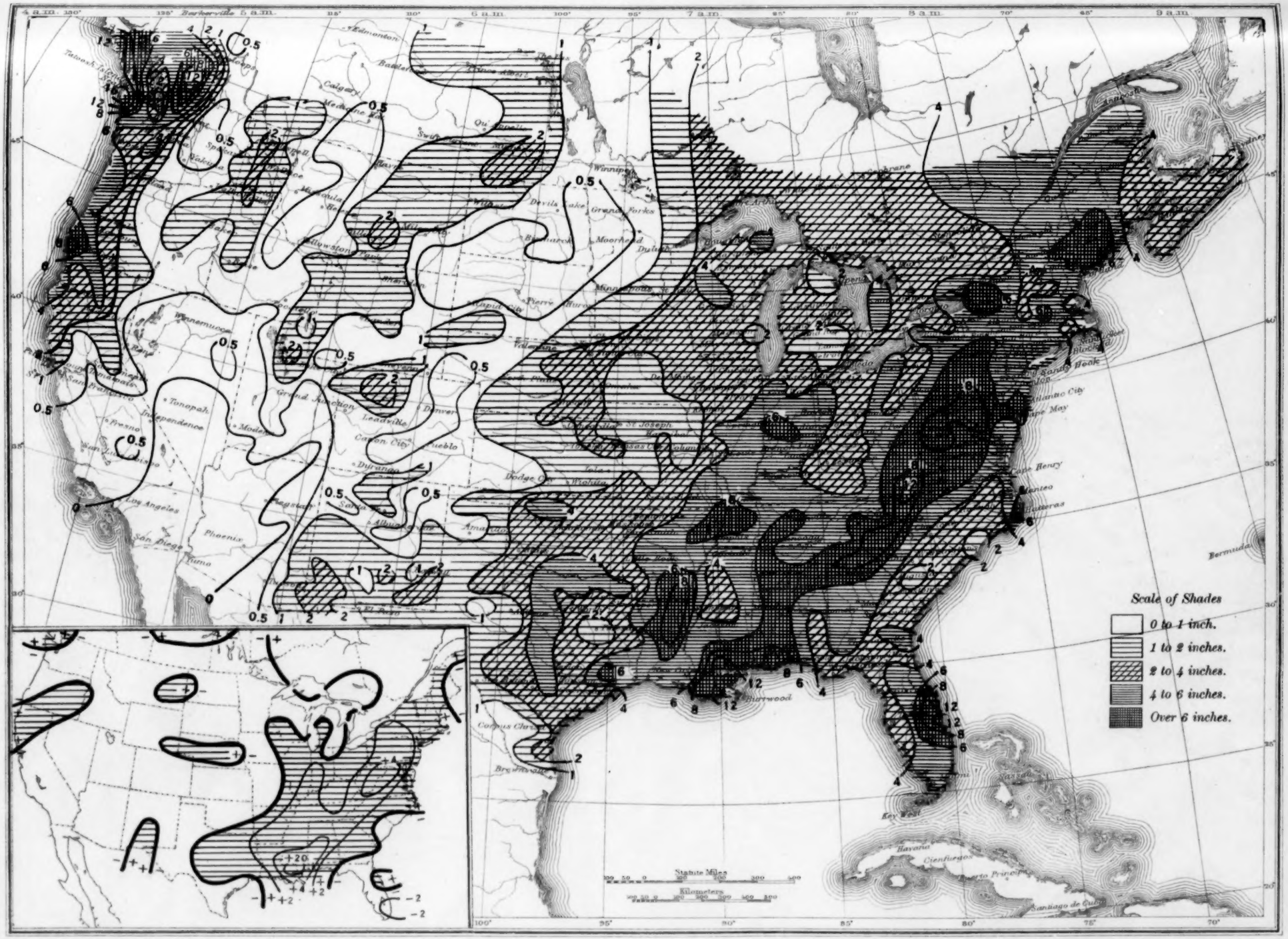


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, October 1937

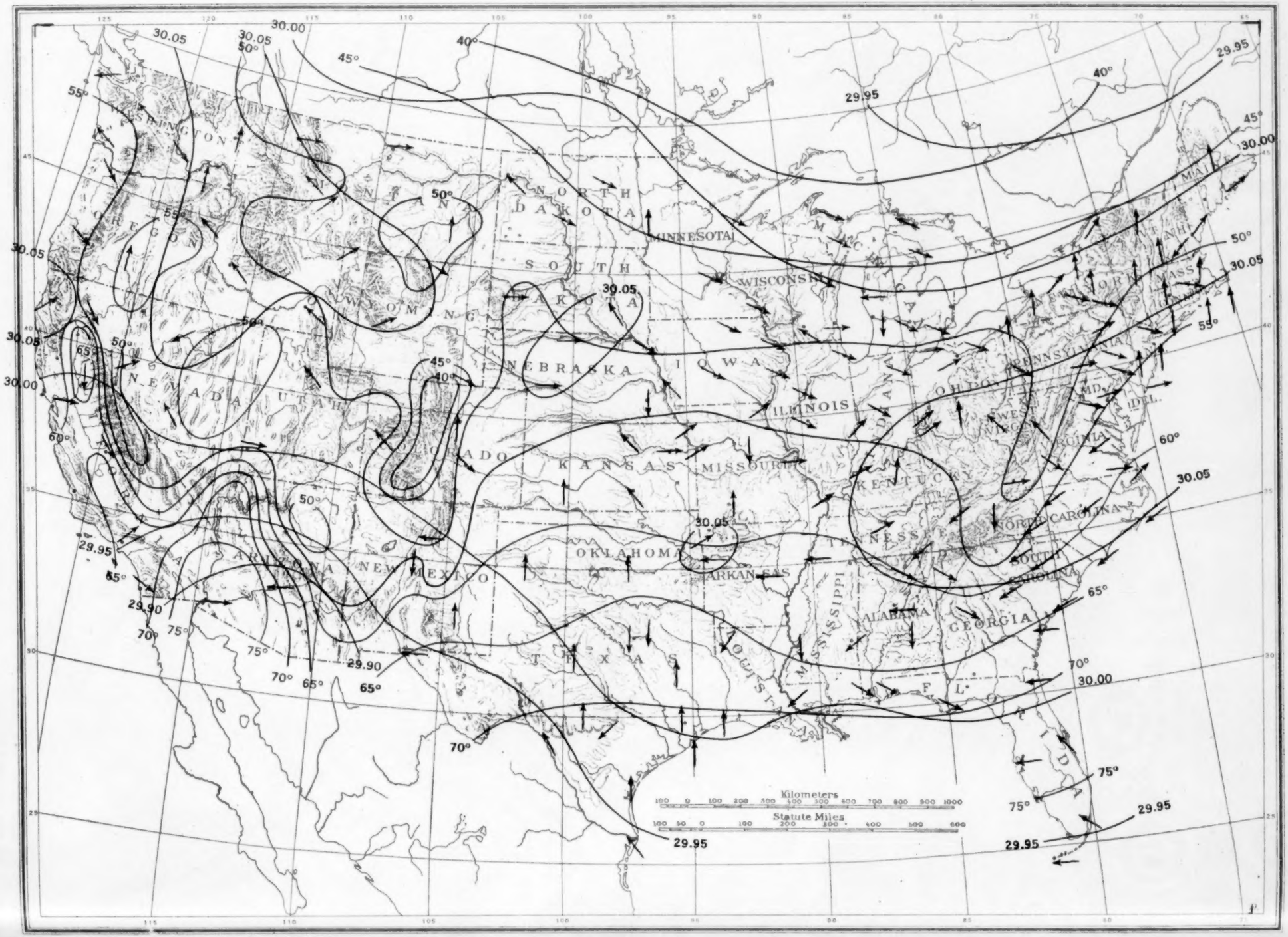


Chart VII. Wind Roses for Selected Stations, October 1937

(Plotted by W. W. Reed)

Chart VII. Wind Roses for Selected Stations, October 1937

(Plotted by W. W. Reed)

Chart IX. Weather Map of North Atlantic Ocean, October 11, 1937
(Plotted from the Weather Bureau Northern Hemisphere Chart)

Chart IX. Weather Map of North Atlantic Ocean, October 11, 1937
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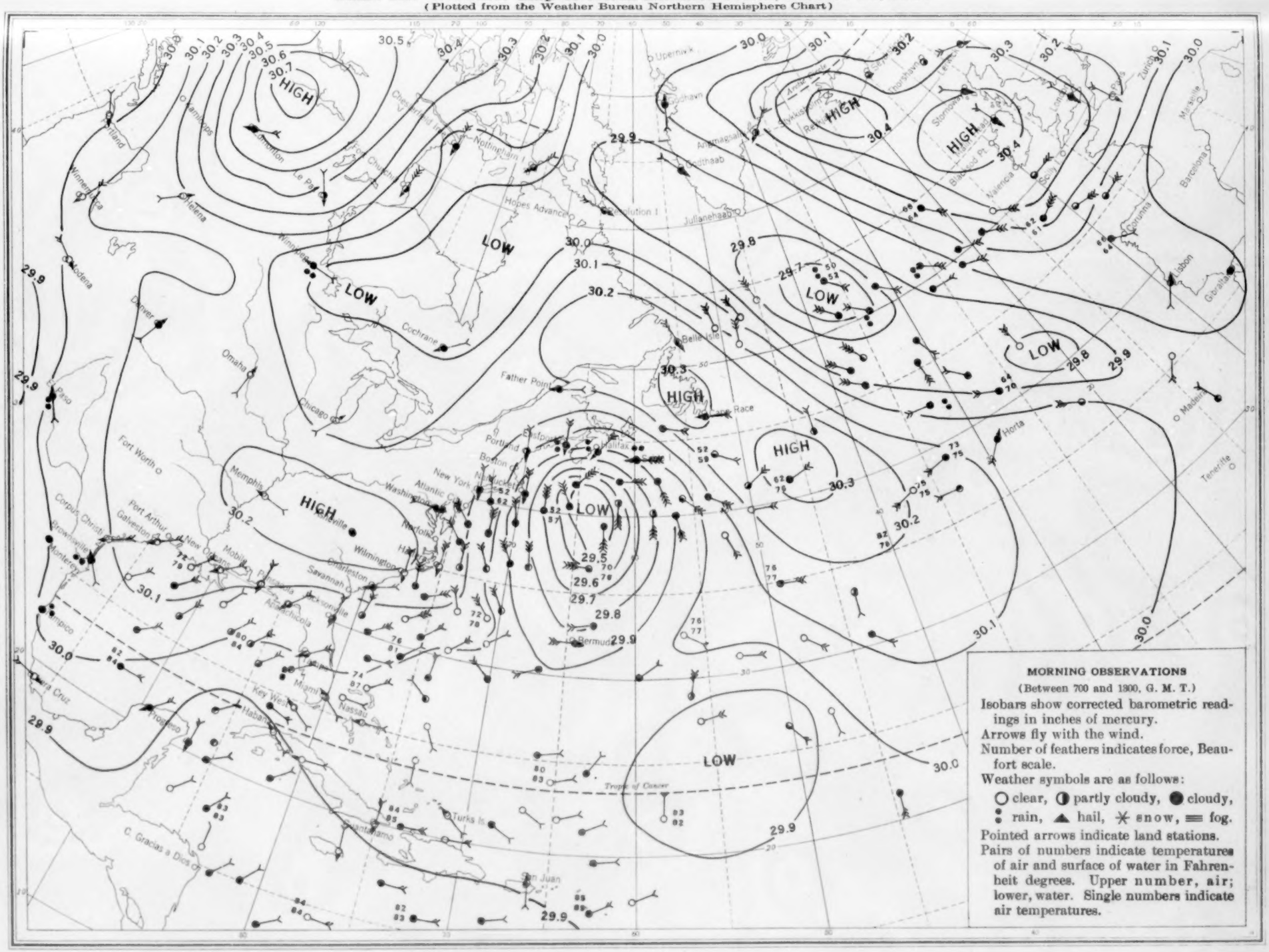


MORNING OBSERVATIONS
(Between 700 and 1300, G. M. T.)

Isobars show corrected barometric readings in inches of mercury.

Arrows fly with the wind.

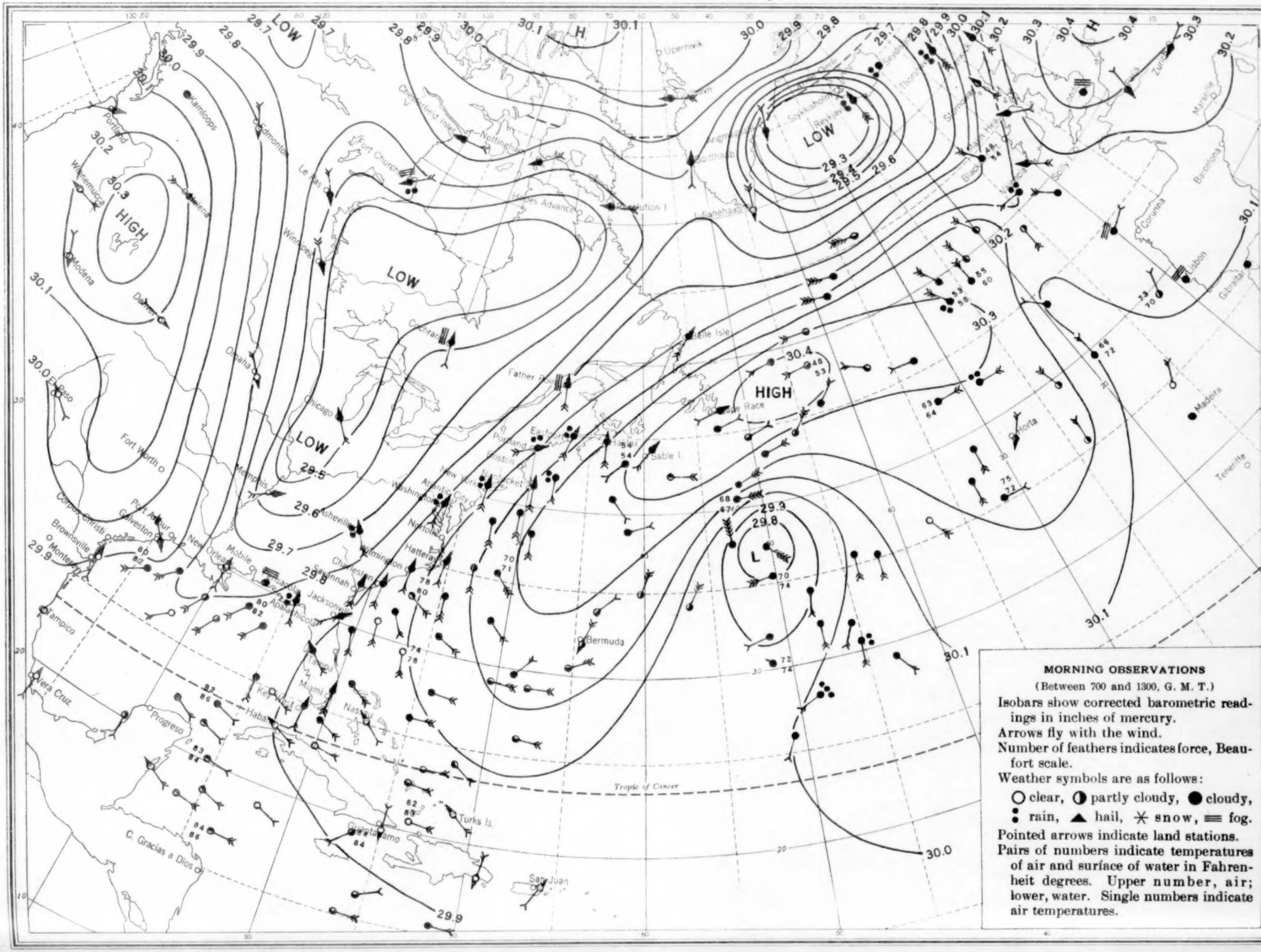
Number of feathers indicates force, Beaufort scale.

Weather symbols are as follows:

○ clear, ◑ partly cloudy, ● cloudy, ⁝ rain, ▲ hail, ✳ snow, ≡ fog.

Pointed arrows indicate land stations.

Pairs of numbers indicate temperatures of air and surface of water in Fahrenheit degrees. Upper number, air; lower, water. Single numbers indicate air temperatures.

Chart X. Weather Map of North Atlantic Ocean, October 19, 1937

(Plotted from the Weather Bureau Northern Hemisphere Chart)